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OPHTHALMIC YEAR BOOK

VOLUME XVI

Containing Bibliographies, Digests and Indexes of the Literature of Ophthalmology, for the Year 1919-1920.

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Preface

This volume is essentially a continuation of the Ophthalmic Year Book, of which it constitutes Volume 16. It is divided into sections corresponding to those of earlier volumes, the contents and arrangement of which are shown, p. v.

Not all subjects appear in this table, but a sufficient number to indicate where any particular topic will be referred to, if it has been taken up in the literature of the period covered. This period is indicated at the head of each section, being in general one year.

The bibliography of each section is arranged alphabetically by authors' names. The titles of papers are given in English, sometimes abbreviated or altered to indicate more clearly what the paper is about.

The digest of the literature seeks to give important, new facts or theories, and some indication of the ground covered by all important papers relating to ophthalmology. Some which contain what is already current in the literature, or are prepared for the laity, are not mentioned.

The name index gives the name of each author whose name is referred to in the bibliography (ordinary Roman type) and in the digest of the literature **heavy-faced type.** The subject index is like the ordinary alphabetic index of a book. Thru it or the table of contents, or the index of authors' names one may find the reference to any particular paper.

E. J.

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Methods of Diagnosis

EDWARD JACKSON, M.D.,
DENVER.

This section reviews the literature of 1919 on ophthalmic diagnosis in general. Papers referring to the diagnosis of any particular disease will be found mentioned under the heading of that disease or the class to which it belongs.

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DIGEST OF THE LITERATURE.

Ophthalmoscopy.—Dufour and **Gaudibert** invite the attention of military surgeons and others who make ophthalmoscopic examinations in large numbers of eyes to the advantages of the indirect method. At the Ophthalmologic Center of North Africa they have used an object lens of 13 D. with a 10 D. lens at the sight hole of the ophthalmoscope. . This method, available without new and expensive instruments, permits the examination of both eyes without shifting the position and without the observer being required to bring his face close to that of the patient. The distance between object lens and mirror required for distinct focussing indicates the refraction of the eye and allows the ready study of the dioptric media.

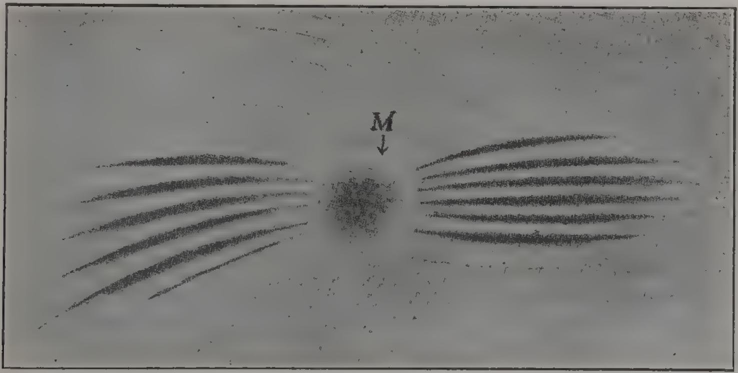

Fig 1. Detachment of Retina. M macula giving no reflex. Small folds in retina to nasal and temporal sides of macula nearly horizontal.

Further observations upon ophthalmoscopy with red-free light are reported by **Vogt**. He gives a series of cases in which following detachment of the retina, true minute folds of that membrane were apparent. These are represented in Fig. 1 by the dark approximately horizontal lines. Such folds were also found in a case of tumor in a boy imbecile with nystagmus. In a boy with retinitis pigmentosa, and in a second imbecile, he found a honeycomb appearance of the macula.. A similar appearance was observed in subacute iridocyclitis. In a case of occlusion of the central retinal vein he noticed in the network figure of the macula larger spaces, each of which contained some blood. By holding the head to one side for three or four minutes the blood was made to gravitate to different portions of each space, always seeking the lower part (see A. J. O., v. 2, p. 336. In explanation of these appearances Vogt refers to sections of the retina received from Professor Fuchs, showing cystic degeneration of the macula with spaces containing blood, from cases of occlusion of the central vein and hole formation in the macula with iridocyclitis.

The papers of **Von der Heydt** have called attention to the observations of Vogt, one of them dealing with a normal and the other with the diseased fundus, and describing the honeycomb and vacuolation of the macula above referred to. He is fully in accord with Vogt as to the yellow color of the normal macula during life. **Heine,** however, failed in numerous instances to observe this yellow coloration. He used, however, green color filters other than the one described by Vogt. **Cohen** experimented with a Wrattner film filter, which, however, does not entirely intercept the red. **Darier** has reviewed the work of Vogt and Affolter.

Claims to priority and adoption of the glass rod mirror for the electric opththalmoscope have been urged by **May** and **Koller**. **Stumpf** has described the use of a pocket lamp for ophthalmoscopy. **Henker** calls attention to the hand ophthalmoscope patented by Schulz following the plan of Thorner.

Numerous ophthalmoscopic observations on eyes with defective vision have been reported by **Middleton,** as found in the examination of two hundred thousand troops. A collection of fundus drawings offered as a nucleus for a more extended collection were exhibited by **Wallace** before the Section of the Royal Society of Medicine. **Gutfreund** reports a case in which the pulsation of a large vortex vein could be seen in each eye. **Sym** has written on the general importance of the familiarity with the ophthalmoscope. **Hartridge's** Manual of Ophthalmoscopy has reached its sixth edition, and **Isakowitz** has written on stereoscopy of the ocular fundus.

Fundus Photography. — **Hagen,** to utilize the whole pupil for rays emerging from the fundus, secures the illumination of the eye ground by using an auto lamp with a metal filament, the light from which is concentrated by an ellipsoid reflector in a point of glass which is placed directly against the sclera. The intensity of illumination can be controlled by a rheostat. For the camera he uses a lens of 60 mm. focal distance, securing a picture 4 diameters larger than the fundus. With photograph plates especially sensitive to red, the necessary exposure is one-half second. By a longer exposure the picture may be taken through an undilated pupil.

He claims it is thus possible to get a much wider exposure of the fundus with a uniform illumination. Two reproductions of his photographs accompany his paper. One taken through the dilated pupil shows a portion of the fundus 5 or 6 d.d. in diameter. The other, taken through an undilated pupil, has a breadth of 4 d.d. and shows the glaucoma cup partly in shadow. Hagen points out that such shadows showing the depth of different objects in the fundus constitute a new method of diagnostic study. By using the camera objective alone, an inverted image of the fundus which may be studied as in ordinary ophthalmoscopy can be obtained through the smallest pupil.

Werthein-Salomonsohn has described his work on photography of the fundus.

Oblique Illumination.—Continuing his studies with the corneal microscope and the illumination furnished with a Nernst slit lamp, **Koeppe** reports appearances hitherto unnoted in the vitreous humor. He has also worked out a method of using polarized light for the examination of the dioptric media. The polarization is effected by the reflection at the proper angle. The appearances thus observed are to be reported in a later communication. **Elschnig** calls attention to the importance of careful study of the reflected images of the source of light obtained from the anterior surface of the cornea (erect) and the posterior surface of the lens (inverted), especially the latter. He reports a case of foreign body in the eye involving the lens in which this method threw important light on the condition present.

Liebermann describes a form of electric lamp (modified pocket flashlight) for use in examining the light reaction of the pupil and testing for double images, as well as the sensitiveness of the eyes to light. The ease with which it is carried to different parts of the field, and turned on and off without sound, are its particular advantages. By the introduction of resistance the intensity of the light is controlled. **Weve** has described a special form of apparatus for testing the hemianopic pupil reaction. The light is directed well toward the periphery of the pupillomotor zone. He gives two examples, one of hypophyseal tumor, and one of cortical thrombosis—the former positive, the latter negative in reaction.

Berger has suggested a new model of magnifying spectacles so mounted that the frame is supported near the end of the nose. These he recommends for observation by oblique illumination especially of pupil reactions, and also for use in operations. **Darier** has reviewed at length the work of Koeppe and others with the corneal microscope, and especially calls attention to the work of Vogt on recognition of different layers of the crystalline lens, to be set forth in an atlas now in press. **Stählin** refers to the brown ring brought out in keratoconus, and states that a similar brown horizontal line may be found in the normal cornea.

Special lamps devised for use in operating (see p. 21) may also prove very serviceable in oblique illumination for diagnosis.

Position of Eyeballs and Interpupillary Distance.—**Henker** calls attention to various instruments, patented in Germany, for measuring the position of the eye in the orbit and the distance of the correcting lens in front of it. A scale described by **Henker** and **Mühsam,** in addition to these, measures the curvature of the surface of the lens and carries a table of the decentering required for given amounts of convergence. **Trendelenberg** has described an instrument for measuring subjectively the distance between the pupils.

Tonometry.—In describing the development of his tonometer (Y. B., v. 15, p. 111), **McLean** calls attention to the insufficient basis for the graduation of the tonometers previously in use. His own has been tried on the human eye and compared with the tension found after enucleation, as well as with the readings of the manometer before the eye was enucleated. He thinks the upper limit of normal tension is higher than has usually been stated. **Bader** has written on differential tonometry.

Radiography. — With the x-ray **Franke** was able to demonstrate a retrobulbar sarcoma, the presence of which was shown at autopsy. He also recognized a shot lying at the right optic foramen which had caused complete blindness of that eye. Five or six weeks later optic atrophy was apparent.

Illumination of Test Type. — The Council of British Ophthalmologists recommends that the minimum illumination should be equivalent to at least three foot-candles on a new card, and that it should be as uniform as possible, artificial being preferred to daylight. The room in which vision is to be tested should be moderately illuminated, with no glaring lights or bright objects in the field of vision. Extreme contrast between the illuminated test card and the background should be avoided. The required light is to be obtained by two 20-watt tungsten lamps, fifteen inches in front of the test card, one each side, twelve inches from the median plane, and one lamp higher than the other. One is placed opposite the junction of the upper and middle thirds of the card, the other opposite the middle and lower thirds, and both are screened from the patient's eyes with reflectors. This gives about ten foot-candles illumination, allowing for variations of current, deterioration of lamps, and darkening of the card with age. Where the electric light is not available, inverted incandescent gas burners, consuming each 2½ cubic feet per hour, may be fixed in similar fashion 2½ feet in front of the card. Or, for light by oil flame standard duplex oil lamps, each having a double straight wick one inch wide, may be placed 2 feet in front of the test card. They recommend that some such method of lighting be compulsory for sight testing in all public services.

For testing vision by feeble illumination, **Tscherning** has devised a method, based on the attenuation caused by successive reflections of the light between two glass plates. He starts his scale with a brightness equal to that of a sheet of paper illuminated by a candle placed at a distance of 45 meters, and each degree indicates an increase of luminous intensity to ten times as great.

Luckiesh, investigating the visibility of airplanes, made many observations on differences of visibility produced by varied illumination and alterations of color and surface. These have not sufficient bearing on ophthalmology to justify extended abstracts here, but they should be studied by anyone investigating the general subjects of visual acuity and illumination.

Test Objects for the Illiterate.—The Committee of the Section on Ophthalmology of the A. M. A., reporting with regard to these, concludes that they should be based on the following principles: The chief lines of the figure should each subtend an angle on one minute. The main body of each character should conform to the five-minute angle, but slight variations from this in the interest of legibility are proper. Masses of black and finer lines are undesirable. The nine figures recommended have already been shown in the Transactions of the Section, and in A. J. O., v. 2, p. 139, and v. 3, p. 21. The cross-point test described (Y. B., v. 8, p. 24) is again brought forward by **Wolffberg.** **Weiss** discusses the advantages of the broken ring, cross-point test and similar figures for testing acuteness of vision.

As an optotype for young children, **Evans** suggests a series of five figures based upon a circle, all of which are supposed to represent objects familiar to children. Besides the circle, the addition of simple black projections give figures intended to represent a cat's head, man's head, bird's head and apple. He has obtained good results from it with children as young as three years, and it is a chart that can be used with mirror, all the figures are reversible. (See A. J. O., v. 2, p. 245.)

Visual Acuity.—The mathematic aspects of visual acuity with allied subjects such as refraction, accommodation, ophthalmoscopy and the ocular movements furnish the subject for a paper by **E. Landolt.** **Dixey** urges that some of the letters often used on test type fail to conform to the Snellen requirements and should therefore not be used. The strike of railway men against a test of visual acuity on the Northeastern Railway of England seems to have been precipitated by an outdoor test with signals that was supposed to be more "practical" than the ordinary type-reading test. It has been the subject of discussion in the papers by **Parsons**, **Paton** and **Butterworth.**

With regard to the vision of aviators **Wilmer** exclaims, "How much there is to learn and how little is known"! **Cantonnet** considers the subject under these suggestive subheadings: Visual acuity under normal illumination; speed of the acuity; hypernormal acuity; vision of dazzling, or against the sun; and nocturnal acuteness of vision. For the first heading the usual tests made under carefully controlled conditions are sufficient.

The quickness of vision is tested by use of a screen moving at an adjustable rate. It shows wide variations of ability in this direction. Of candidates examined, 14 percent required more than one second to use the test; 48 percent read it in one second, 35 percent in one-half second, and 3 percent in one-fifth of a second. As to so-called hypernormal acuity, 83 percent of the candidates possessed it, as estimated by the usual standards, and 7 percent had double the standard vision. To test the power to resist dazzling a sort of artificial sun of 800 to 900 candle power was placed at five meters, the light having a diameter of 10 cm. The broken-ring test was then placed alongside of this, 22 mm. from its circumference. Under these circumstances, of 100 examined fourteen showed standard vision and fourteen showed 0.9 vision; twenty-seven V. equal 0.8; fourteen V. equal 0.7; sixteen V. equal 0.6, and thirteen V. equal 0.5, and two had less than 0.5 vision.

For night service the acuity by reduced illumination (adaptation) is of the highest importance. Cantonnet arranged a dark room where five candidates could be examined at once. Each was kept there ten minutes, one coming in and one going out every two minutes. The test object was a light, obscured by a smoke glass photometer. Of one hundred examined, twenty-three perceived the light in three seconds, forty-three more in five seconds, twenty in ten seconds, six in fifteen seconds, three in twenty seconds, three more in twenty-five seconds, and two were unable to see it at all. These facts indicate what a superficial knowledge of the function of vision is obtainable by our ordinary tests.

The standard of visual acuity required in the British Air Service, according to **Brailey**, was at first "very high". Later it was somewhat relaxed, the lowest vision permitted being 6/18 in the better eye and 6/24 in the worse. Corrected by glasses to 6/6 and 6/9. No rejections were made for faults of muscle balance, apart from actual squint. In discussion of the above, Major Clements pointed out that 26 percent of the men had glasses ordered, and of 294 men 60 percent had to be rejected on account of bad landings. To carry out a plan of diagnosis, even more elaborate than that of Cantonnet, would certainly be less expensive than furnishing air planes to be smashed in the demonstration that the candidates were not fitted for the service. It must be added that the latest standard of vision in the Royal Air Force is 6/6 in either eye, and that latent hyperopia of 2 D. disqualifies. **P. Knapp** reports on the examinations of visual acuity in the Swiss army.

Light Sense and Adaptation.—From his study of the eyes and work of the signal man in the navy, **Duane** concludes that visual acuity as ordinarily measured is less important than the light sense. The relative importance of light sense and adaptation has been impressed on numerous observers since the beginning of the late war, and several methods of measuring them have been suggested. A new type of photometer has been devised by **Downey**, based on the use of the radio-active combination of zinc sulphide with radium known by the trade name of ''marvelite''. The luminousity of this substance decreases at first, but by the end of a year becomes practically constant. The standard marvelite button is just visible when the eye first comes into a photographic dark room from a well-lighted room at midday. Plates of white celluloid placed in front of this render it less visible. One to five discs of this substance are placed before the marvelite, giving different reductions of its original luminousity. The length of time required for these to become visible one after the other gives the rapidity of dark adaptation. The use of this instrument can be better understood from the illustrations in the original article. (A. J. O., v. 2, p. 13.)

The idea of using a radio-active preparation of constant luminousity also occurred to **Stargardt**, who reports comparative observations with it and with Nagel's adaptometer showing close correspondence between the two. He has not suggested any practical instrument for clinical use. **Birch-Hirschfeld** has suggested what he calls a five-point adaptometer. The person tested looks at five different openings, the illumination of which depends on a small pocket incandescent lamp shining on milk glass, the brightness being controlled by an aperture which varies from 1 to 18 mm. in diameter. An improvised adaptometer for use in the field is described by **Wiedersheim.** A small incandescent lamp is placed on a rod and thus introduced into a tube one meter long. One end of the tube has a cap with an opening in it that serves as the test object, being covered by paper illuminated from the lamp. The illumination is controlled, made more feeble, by withdrawing the lamp from the paper, the exact distance which it is withdrawn being read from the rod. The materials for this kind of apparatus are generally readily obtainable. Photometric studies with reference to the illumination afforded by flares and by self-luminous radium paints, with a description of two forms of photometer, have been published by **Trotter.**

Fields for Movement.—Attention is called by **Spiller** to the observations and conclusions of Riddoch with regard to the fields for the perception of movements. Riddoch found that when a part of the field of vision had been lost recovery began with perception of movements in this part of the field before objects could be recognized or their form perceived, and he concludes that the perception of movement is dissociated from perception of light, color and form in the visual centers. Spiller reports a case in which tumor of the pituitary gland had caused, with choked discs, impairment of the temporal visual field, which had gone on to blindness, except that when first seen the patient could recognize movements in the nasal field, although she could not distinguish form. He thinks the case indicates that motion is probably the last form of vision to disappear. He accepts Riddoch's view that light and movement are probably the most primitive visual precepts; and, being essential to animals for hunting and for self-preservation, they would naturally have a wide field.

Perimetry.—To combine the advantages of the Bjerrum screen and those of the arc perimeter, **Hudson** has devised a perimeter with a quadrant having a radius of one meter. (See Fig. 2.) The test object can be varied in size and color and is moved by a wire passing around the disc B, one and one-half revolutions of which carry the test object the length of the arc. The smaller disc C, one-third the diameter of the first, moves a cord that carries a pointer over the surface of the large screen D, which is weighted so that its vertical meridian remains always the same. It carries a chart on which the field is mapped, to be studied in detail. The smaller disc E may be used for making a small chart for permanent record. In discussion Mackay stated he had used a perimeter with an arc with one meter radius and 10 cm. wide for many years for the measurement of fields of vision and muscular anomalies.

Binocular Vision Tests.—As **Wilmer** points out, "Affections of only passing inconvenience on the ground are serious in the air," and among such he mentions heterophoria, and concludes that "absolute normality of the eyes is one of the greatest physical assets that a flyer can possess". And it can be easily understood that for a man making a landing with an air plane judgment of distance is of the highest importance. The measurement of the power to judge distance was therefore of great importance in the examination of those who would be flyers. This problem was taken up by **Howard,** whose papers on test for the judgment of distance at six meters, and at one hundred meters, or beyond, are discussed in the chapter on Ocular Movements. These tests were directed particularly to ascertaining the minimum binocular parallax necessary for judging the relative distance of two objects. But he recognizes that other factors enter into judgments of distance. The results of his work seem to show that parallax may be an important factor in forming such judgments at much greater distances than was formerly supposed.

A special apparatus for testing binocular perception of distance, essentially different from those heretofore in use, is proposed by **Cohen.** In a hollow iron cylinder closed at one end by a black metal disc are placed four objects, either Snellen letters or colored plates, each illuminated by an electric light directly behind it. Each of these

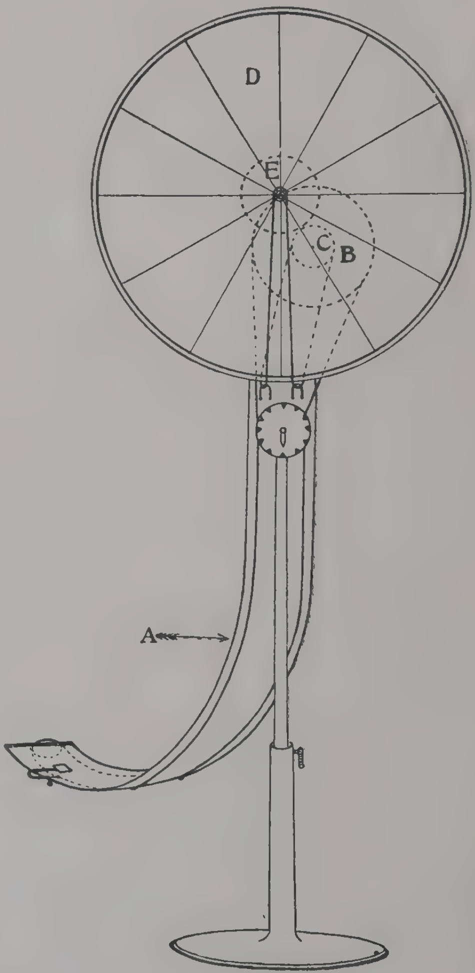

Fig. 2. Hudson's perimeter, the arc A having a radius of 1 meter. B disc moving wire that carries test object. C disc concentric with B moves pointer over screen D, which carries chart for mapping the field. E disc to carry small charts for permanent records.

objects is supported on a tube, which can be withdrawn a variable distance through the black metal disc that closes one end of the cylinder. (See Fig. 3.) The person to be tested is placed thirty or forty feet in front of the apparatus and required to name the letters in succession in the order of their nearness. **Würdemann** redrew and relettered the German stereoscopic card for testing the binocular perception of depth or distance at a near point. This was found serviceable as a rapid test to exclude many applicants for the air service, but insufficient to measure with minute accuracy their relative power of judging longer distances.

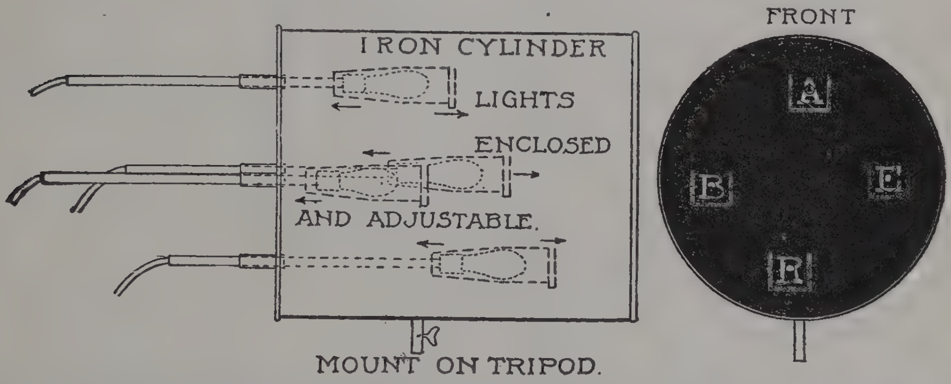

Fig. 3. Cohen's apparatus for testing stereoscopic vision at distance of 30 or 40 feet. Scale of one to eight.

The Diagnosis of Malingering.—The problem of unmasking simulation in the army differs from that presented in civil life. **Sichel** points out that in the latter the malingerer usually maintains that he is blind in one or both eyes, or has no useful vision, while in the army examination he merely seeks to show that his vision falls below a certain standard. To unmask simulation of this kind Sichel had a test card arranged with letters of different sizes on the same line. The largest of them was smaller than the largest usually placed on test cards, and the card was small, to give the impression that the letters were larger than they really were. This unusual arrangement of the test confuses the malingerer sufficiently to cause him to read letters that indicate vision above the above required standard.

A new instrument which he calls the "malingeroscope" has been described by **Alger.** It consists of two parallel cylinders four inches long and one and one-half in diameter, arranged side by side like an opera glass. (See A. J. O., v. 2, p. 113.) The distal end of each is covered by a cap with a six millimeter opening placed eccentrically. By rotating these caps the distance between the two openings can be varied from 45 to 70 mm. Through this the person to be tested looks at two cards of test letters placed side by side, twenty feet away and eighteen inches apart. When the apertures are turned so that the distance between them equals the distance between the pupils, the right eye sees the right card and the left eye the left card, but neither eye can see both cards. When the apertures are brought nearer together both eyes see the same card. When they are brought still closer the right eye sees the left card and the left eye the right. When the malingerer is required to read through such an apparatus and the apertures varied, unless he refuses to read at all he will do so with the alleged bad eye when he supposes that he is reading with the good one.

Panni has systematized and designed an instrument to facilitate the testing of the vision at different distances and with different degrees by artificial myopia. The better eye is thus tested by placing before it convex spherical glasses progressively stronger, and the reduction of vision they cause noted, until it is below what is alleged to be the vision of the bad eye. Then the alleged blind eye is similarly tested, but with lenses sometimes stronger, sometimes weaker. Under these conditions the malingerer becomes confused and gives contradictory answers.

Bartok has unmasked simulation by using before one eye an opaque disc, and before the other a similar disc with a stenopaic slit in it. He found most persons with normal eyes were unable to tell which one they were seeing with. **Birch-Hirschfeld** arranged an apparatus in which the test objects of various sizes could be placed by a lamp affording variable illumination, requiring these to be identified at different distances and by different degrees of surrounding illumination, generally reveals better vision than the malingerers wish to acknowledge. **Allport** and **Smith** had a pair of reversible spectacles made, one with a strong convex lens, the other with plane glass, for the additional confusion of the malingerer in applying the ordinary convex lens test. **Bjerke** has applied the plan of having the simulator read tests of various sizes at different distances, and for this purpose has had reduced reproductions of test cards made by photography. He also puts forward apparently as something new the cylinder test described by the reviewer more than twenty-five years ago.

Azmy points out regarding these tests: "It does not matter how many different ways a surgeon knows, the most important point is to gain the man's confidence." Referring to malingering in the Egyptian services, when the man comes with an official letter for examination he writes a reply in agreement with the man's wishes, signs it in front of him, and gives it to the hospital clerk to dispatch. Of course it will not be dispatched, but the man is asked to return to have his condition carefully treated for his own benefit. At the second visit, or sometimes immediately after the letter has been sent, it becomes possible to ascertain his real vision. For hemeralopia it may be best to admit the man to the hospital, ostensibly for treatment, and then to observe his vision at different times at night. Azmy also points out that some surgeons lose patience in dealing with such cases and maltreat them without justification, or hurry to pronounce the case one of malingering without careful examination. He instances a healthy looking policeman, complaining of blindness in both eyes, and pronounced a malingerer after a superficial examination. Careful ophthalmoscopic examination showed advanced albuminuric retinitis, and, on boiling, the urine was found nearly half albumin.

To induce conjunctivitis for the purpose of malingering, **Lafon** reports the use and effects of a proprietary purgative called "grains-de-vals". This contains podophylln, cascara and buckthorn, or aloes. It is dispensed in pilules, the black substance of which may be found in the conjunctiva. He records nineteen cases, in which the use of this irritant was admitted. In one case, in which both eyes were affected, there was a slight escharotic action on the conjunctiva and some involvement of the cornea, noticeable on the fifth day. But recovery occurred within two weeks. In the lighter cases the conjunctiva was congested especially in the lower culdesac. There was some pericorneal redness, a little lacrimation and external irritation of the eyes, but no purulent discharge. The cornea might be hazy, but did not stain with fluorescein. There was but little pain or photophobia. The condition cleared up in about a week.

Keiper has reviewed and discussed twenty of the most valuable tests for ocular malingering already familiar to the profession. **Goldmann** has proposed the nystagmus produced by caloric influence on the semicircular canals as a method of revealing simulation of certain disabilities due to lesions of the central nervous system.

General Papers.—The research work done at the Mineola Laboratory of the Air Service Medical had largely to do with the comparison and development of diagnostic procedures. **Lancaster** gives a general review of it and points out that such investigations have been carried on largely by psychologists and physiologists, and that very little of value has been done in this direction in medical laboratories by ophthalmologists.

Ebstein has written on the differential diagnosis of spots upon the exposed portion of the eyeball. These occur in a considerable proportion of cases of ochronosis and are of considerable diagnostic significance. Such spots may be simulated by those produced by splashes of carbolized oil in the conjunctiva, and when due to this cause may persist for years.

Therapeutics

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This section reviews the literature referring to general therapeutics for the year 1919. The therapeutics of particular diseases, either constitutional or local, will be noticed in the sections referring to those diseases.

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Serum and Protein Therapy.—Jacovides reviews the history and method of use of autoserum in ocular therapeutics. He used this method of treatment in 221 cases. In 150 ulcers of the cornea, with hypopyon, 140 were cured after two or three injections of the serum. In 51 cases of abscess or corneal infection cures resulted in from four to six days after one or two injections had been used. Good results were obtained in corneal infections, due to direct traumatism or following operation, in iridocyclitis and other ocular inflammations.

Iritis, ulcers of the cornea, keratitis, traumatic and post-operative eye infections, ocular tuberculosis and other eye inflammations have been treated by parenteral injections of sterilized milk. Good results have been reported by this method of treatment by **Carreras, Darier, Domec, Gaupillat, Berneaud and Guibert.** Darier believes that the milk stimulates the formation of leukocytes. Guibert thinks that the beneficial action can be explained by an increase of opsonins and antibodies in the blood. Guibert also injects milk subconjunctivally, using cocain to control the pain, and claims that this method of treatment is of value in the treatment of phlyctenules in children.

Encouraged by the work of American authors with the intravenous injection of peptone for gonococcic rheumatism, **Titus** has experimented with what he calls "pyreto-therapy". He considers that with proper application that it has a therapeutic value. The author writes at length and appends a bibliography of earlier work.

Nolf injects 5 or 6 cm. of a 10 to 100 peptone solution into the veins, and repeats in two hours if necessary. He uses it in ocular troubles occurring during typhoid, typhus and septicemia.

Radiotherapy.—Terrien and **Ledoux-Lebard** discuss the action of the x-ray on the tissues of the eye. They conclude that in the normal eye the conjunctiva is more sensitive to the rays than the lids or periorbital tissue, and an acute or chronic conjunctivitis can be produced by exposure to the ray. The other elements of the globe, the retina in particular, are not affected. In their experiments with the x-ray they never observed a lesion of the crystalline lens, the vitreous, or the retina. They recommend its use in the treatment of sycosis and trichiasis of the hair of the lids, in papilloma of the lids, in xanthelasma, xeroderma pigmentosum, angimoas of the lids, and in malignant tumors it is a great aid supplementary to surgery. **Axenfeld** has contributed to the literature an article on intraocular ray therapy.

Electrotherapy.—In the hands of **Gros** and **Fromaget** a weak faradic current has produced analgesia in cases of irido-cyclitis, acute conjunctivitis, keratitis, glaucoma and neuralgia. The seat of the pain is covered with moist compresses which come in contact with one pole of the current. The other pole is held in the hand. The amount of current should be just enough to be felt without being disagreeable.

For fifteen years **Harris** has been employing electricity for the treatment of diseases of the eye. He uses all forms, but believes that constant and sinusoidal currents are of the greatest value.

Collyria—Nakamura found after experiments with collyria that most of those that are used act harmfully upon the corneal epithelium by reason of their hypotonic effect. To counteract this one should stimulate the lymph flow in the eye by use of 1.2 percent or 1.3 percent normal salt solution.

Binder writes a paper to extol the

virtues of a solution of eserin in a neutral oil put on the market under the proprietary name of "physostol". The 1 percent solution may be diluted with olive oil. He claims it is unirritating, is not diluted by the tears, but forms an emulsion with them, is easily kept sterile and does not become more concentrated by evaporation. It is dispensed in bottles having a stopper, in the form of a glass rod with a spoon-shaped end, by which the drop is to be introduced into the eye.

Subconjunctival Injections. — Aubineau found that two minutes after the subconjunctival injections of 1 cc. of salt solution there was a decrease in the pulse rate varying from 16 to 36 per minute. Reestablishment of the regular rate accurred in 4 to 9 minutes. In one case out of nine there was no change. The decrease in the pulse rate coincided as a rule with the period of pain following the injection, but not always. The author believes that the condition is an oculo-cardiac reflex. Injections of sublimate, although more painful, were not accompanied by change in the pulse rate. It is probably the amount of the fluid injected, rather than the pain, which causes the phenomenon.

Mydriatics and Myotics.—Hoff-Markirch uses homatropin in compressed discs for dilation of the pupil. For the usual dilatation one is enough, and for the maximum dilatation two or three should be used. Discs of 0.005 are equal to one drop of a 1 percent solution.

Nakamura and **Myake** instilled adrenalin into the eye of a frog and noted a disturbance of the epithelial cells of the cornea, mydriasis, and changes in the visual purple. The authors conclude that the avenue of action of the adrenalin was directly through the cornea, lens and vitreous, and not indirectly through the blood or through the conjunctiva, sclera and choroid, since the changes were not observed in the other eye.

Dionin.—Wolffberg used dionin in conjunction with the usual therapeutic agents in a case of trachoma, keratitis fascicularis, and in an eye injured by a sharp splinter of wood. All three cases rapidly improved. He also describes peronin, a derivative of morphin, which has been advocated in place of dionin, and contrasts the intense reaction it produced with the mild reaction of dionin.

Iodin.—After studying the passage of iodin into the eye tissues during the absorption of iodin compounds in the rabbit, **Nakamura** and **Mukai** found that a 1 percent solution of potassium iodide instilled into the eye penetrated the cornea and entered the aqueous humor, but did not pass into the lens and vitreous. After a subconjunctival injection of 1 percent potassium iodide a small quantity of iodin was found in the aqueous. It was absorbed indirectly through the conjunctiva and cornea, and only slightly through the sclera. After the administration of 10 cc. of a 2.5 percent potassium iodide internally, iodin was found in the blood in twenty minutes, in the aqueous in thirty minutes, and in the cornea and vitreous in forty-eight hours, where it stayed for sixteen hours. After subcutaneous injection, iodin was found in the blood and the aqueous in ten minutes. The maximum amount in the blood was reached in two hours, and in the aqueous the maximum was reached in four to eight hours. Intravenous injection caused the immediate presence of iodin in the blood, and its presence in the aqueous in two minutes. The maximum in the aqueous was reached in one and one-half hours. It was found in the cornea and vitreous after forty minutes, and was present in the cornea after nine hours and the vitreous after twenty-one hours.

For man, the amount of iodin found in the anterior chamber after the instillation of iodin into the conjunctival sac was somewhat less than in the rabbit. Following the intravenous injection of sodium iodide the maximum amount of iodin was found in one and one-half hours in man just as in the rabbit. The hypotonic solution of potassium iodide penetrated the aqueous of both man and rabbit more quickly than the isotonic.

The hypodermic use of iodin has given satisfactory results in **Kerry's** cases of septic iritis and tuberculosis of the eye. The author uses the iodin in sesame oil, one to forty. Ten minims are injected subcutaneously once or twice a week.

Terson used a solution of iodin 1.0, chloroform 30.0, with good results in corneal ulcers, trachoma, wounds of the lid, suppurative blepharitis, eruptions, parasites, and infections of the lids of all kinds. The remedy may be applied by means of a pledget of cotton. The chloroform evaporates rapidly and no bad effects occur after using large quantities of the solution.

Dressings.—Wolffberg uses a combination of glycerin, tragacanth and gelatine as a paste for fixing bandages to the eye. A mixture of tragacanth 5.0, glycerin 2.0, and distilled water 100.0, painted over the skin, will protect it from tears or suppuration. It is also valuable in the treatment of eczematous conditions of the skin.

Wetterer claims that the dry treatment of burns is the only logical treatment. The use of a powder is simple and aseptic.

Antiseptics.—Fürstenau believes that the failures with solutions of trypaflavin do not prove that it is not a specific for gonococcus infections. He reports the results obtained after its use in seven cases. In five of the cases the results were good; in one case it had a favorable influence, and in another it was not successful.

Lawson describes the chemical nature of flavine. The drug exists on the market as acriflavine and proflavine. Acriflavine is the methylchlorid of diamino-acridine, whereas proflavine is the hydrochlorid of sulphate of the same base. The antiseptic properties of both drugs are almost equal, but proflavine is the least irritating and is the drug of choice for eye therapeutics. The strength of the solution should be from 1:1000 to 1:4000, the weaker solution being preferable. The author insists that flavine is an antiseptic and not a disinfectant, and is to be used with the intention of preventing rather than curing sepsis. It is of the greatest value in wounds caused by foreign bodies; in wounds requiring sutures; when operative measures are necessary in the so-called "dirty" eye, and as a moist dressing for skin grafts. It is of little value as a curative measure in inflammatory eye conditions, especially if they are severe.

McIlroy found that methylene blue had comparatively little bactericidal action on the staphylococcus obtained from the eye socket. Dilute emulsion of the micro-organism twenty-four hours after exposure to the drug still yielded growth after incubation.

Chevalier writes on the use of "collargol" in ophthalmic practice.

Gradle found from clinical experience that ethylhydrocuprein in 1 percent solution cured most cases of conjunctivitis, due to the pneumococcus, in seventy-two hours. Its success in dacryocystitis depends upon whether the pneumococcus is the actual cause, or is merely accidentally present. Gradle noted that it was also a specific for the xerosis bacilli, and caused them to rapidly disappear from the conjunctiva when the drug was used.

Having difficulty in obtaining optochin, **Marin** employed a 1 percent solution of quinin hydrochlorid as a substitute in the treatment of corneal ulcers. The results were as good or better than those obtained with ethylhydrocuprein. It was also used extensively in trachoma in gonorrheal conjunctivitis, and conjunctivitis due to the pneumococcus, with excellent results. In some cases the quinin solution was injected into the subconjunctival tissue and did not produce toxic symptoms. The author concludes that quinin hydrochlorid has a well-defined bactericidal action upon pneumococci which is equal to that of optochin; that cases are cured in a shorter time and no cicatricial tissue is left. Marin recommends its use in preference to optochin because the itching is less, caustic action is not so great, and it is cheaper.

Zbikowski uses chlorid of quinin in ocular therapeutics and concludes:

1. That the drug diminishes the scar tissue in cases where the cornea and

conjunctiva have been burned by caustics.

2. It can be substituted for ethylhydrocuprein in pneumococcic ulcers.

3. The duration of keratitis is shortened when it is used, and the scars are thinner and more transparent.

4. It can be used in the strength of five parts to one hundred for direct application to the cornea.

5. Subconjunctival injections of a one to one hundred solution is not superior to local application of the pure powdered quinin hydrochlorid.

In the treatment of the human conjunctiva **Abelsdorff** uses a solution of 6 percent "ormizet" (formiate alumin combined with alkalin sulphate in double molecular quantity). It is his drug of choice in the treatment of acute and chronic catarrhal conjunctivitis caused by specific bacteria. The solution is instilled three times a day. In a number of cases it has resulted in complete cure. In old, stubborn cases which have resisted zinc sulphate, silver nitrate and collargol, ormizet has caused improvement. The author uses a 6 percent solution in blennorrhea of the lacrimal sac. The strength of the solution should not exceed 6 percent because the skin might absorb the color.

Abecassis used saturated solutions of sodium sulphate for ocular irrigation in all conjunctival troubles, foreign bodies of the cornea, etc. The eye was irrigated with the hot solution for fifteen minutes twice a day. The author obtained cures in most cases in two or three days.

For the treatment of sloughing of the cornea, suppuration of the tear sac and fistula, **Piesbergen** and **Weiss** use an ortizon pencil.

Markbreiter experimented on the eyes of rabbits with Bergelen (fibrin powder) to see what action the fibrin would have on the delicate elements of the eye and found that the ocular tissues supported it well. It provoked no inflammation in the anterior chamber and seemed to effect a cure of wounds by sterilization. The author then used it in man with good results in purulent keratitis, burns of the cornea, after cataract extraction, and operations on the cornea and sclera.

Anesthetics.—Sollmann found that benzyl alcohol produces as complete anesthesia of the cornea as cocain, but its period of action is shorter. The most serious objection to its use in the eye is the smarting which follows the application. The smarting produced by a 1 percent solution of benzyl alcohol is much greater than with 1 percent cocain hydrochlorid.

Frias Onate uses cocain in the strength of from 10 to 20 percent. The author mentions several cases of serious collapse from the use of the 10 percent solution, but thinks that it is because an old solution had been used. When fresh, Frias believes that the drug is safe in these strong solutions and complete anesthesia is obtained.

Systemic Remedies.—Santos Fernandez gave mercury to a large number of cases that were not suspected of being syphilitic and got very good results. The author believes that in most cases where mercury acts so beneficially that the subjects probably have hereditary syphilis.

Johnson concluded from clinical and experimental evidence that the fear of production of blindness following the administration of therapeutic doses of salvarsan is unwarranted, and in the event of an optic neuritis of syphilitic origin speedy improvement follows the administration of the drug.

Dunn advocates the use of thyroid therapy in eye conditions of inflammatory origin. He believes that in many cases hypothyroidism exists and a toxemia of septic origin occurs which results in eye disease. The author advises its use for irido-cyclitis, sluggish corneal ulcers, interstitial keratitis, hemorrhagic eye manifestations such as subconjunctival and retinal hemorrhages occurring in young persons, and in asthenopia occurring at the time of the menopause. He follows the rule, "When in doubt, try thyroid."

Muncaster prefers thyroid substance to the extract and uses ductless gland products for many eye conditions. The author insists on fresh preparations and uses it in pill form in the following combination: thyroid substance one grain, pituitary body one-third grain, pancreatin one-eighth grain, sodium cacodylate one two-hundredths grain, sach. lactis one grain, and tragacanth one grain.

Operations

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This section reviews the literature of 1919. Only general operative procedures are reviewed. All particular operations will be found under the headings of the portions of the eye on which they are practiced, or in connection with the diseases which render them necessary.

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Disinfection.—Guiral uses a mixture of 0.5 gm. each of crystal violet and verde violet in 50 gm. each of water and 80 degrees alcohol. This is applied freely to the eye after the cocain, and in a few minutes he rinses off any excess of the stain. If the eyeball is very intensely stained he anoints it, and the operation can proceed with all confidence that the tissues are perfectly sterilized. Success in a series of one hundred cataract operations amply proves this.

Arens advocates a double sterilizing vat, the false bottom of which is removable and perforated. The noncutting instruments are placed in the lower portion of the vat. The level of the water in the vat is just below the level of the false bottom. Devices are attached for holding cutting instruments immobile, preventing their being dulled by other instruments. When the water is boiling the non-cutting instruments are sterilized in it, but the cutting instruments are sterilized by the steam which rises through the perforations. Arens sterilizes these instruments for fifteen minutes without the slightest dulling, and with no case of post-operative infection.

Before operations **Gocht** cleanses his hands not with soap, but with a preparation which he calls "Blitzblankpulver" (lightning white powder). After wetting his hands he dips them into this powder, thoroughly rubbing it in, allows them to soak in warm water for ten minutes, and then rinses off the powder. This removes all traces of iodin or other chemical that have discolored the skin. After drying his hands he dips them into a sterilizer filled with a 60 percent solution of alcohol, glycerin 30 percent, and liquid paraffin 10 percent. With this care his hands rarely crack or get rough. He also uses sterilized damp rubber gloves. He considers this method strictly efficient in making the hands aseptic for any operation.

Anesthesia.—Rutherford believes that the lacrimal secretion is a guide to the recognition of the different stages of surgical anesthesia. With the onset of the excitement stage the lacrimal glands become necessarily active and pools of secretion appear at the inner canthi. The cessation of the lacrimal secretion usually takes place a little before the complete abolition of the corneal reflex; however, they may disappear simultaneously. During the stage of surgical anesthesia the lacrimal glands cease to secrete. The time of the cessation of the lacrimal secretion during the induction period corresponds almost exactly with the time of its reappearance during the recovery period. Thus the absence of the tears means absence of corneal reflex and surgical anesthesia. Withholding the anesthetic until the tears reappear indicates the presence of the corneal reflex and that the patient is coming out of surgical anesthesia.

Gwathmey and **Karsner** make a preliminary report upon the induction of general anesthesia by oral administration of certain drugs a few minutes before short operations are performed. In case of longer operations it may be necessary to supplement the analgesia by a hypodermic of morphia, or even by light inhalation anesthesia. They recommend the following formula:

Chloroform ½ to 1 drachm.

Ether and liquid paraffin each 3½ drachms.

In giving the mixture a mouthful of port wine is retained for about thirty seconds and then swallowed. The ether mixture is next given, and followed by another dose of the wine.

Würdemann describes his method of using hyoscin-morphin analgesia in ophthalmic operations. After the usual preparation has been completed, one hour before the time set for the operation, one-fourth of a grain of morphin and one one-hundredth of a grain of hyoscin are given hypodermically. The patients become somnolent, but most of them are able to make volitional movements of the eyes and to answer questions. Some of them may become comatose. For local anesthesia at the time of operation, three instillations of 5 percent cocain muriate solution are made, usually with one drop of one one-thousandth adrenalin, and the operation is commenced. Untoward effects are uncommon.

In discussing Würdemann's paper Fowler said that in general surgery he gives one-eighth of a grain of morphin forty-five minutes before the operation. This dose is repeated at the time of the operation, provided there are no ill effects from the first hypodermic injection. In the event that the operation is long, he gives the same amount during the operation, making three-eighths of a grain of morphia in all. Two hours before operation Peter gives each patient ten grains of chloral and fifteen grains of sodium bromide. One hour before operation the same dose is repeated. One-half an hour before operation, female patients are given one-sixth of a grain of morphin with 1/150 grain of atropin sulphate. Male patients are given one-fourth of a grain of morphin, with 1/150 atropin sulphate. This preparation brings the patient into the operating room in a perfectly quiet and more or less somnolent state. Two things are accomplished—the squeezer is practically eliminated, and the patient is free from apprehension.

For enucleations, cataracts, sac excisions, iridectomies, trephining, etc., requiring deep anesthesia, **Taylor** uses novocain with suprarenin borate, which he injects with a curved needle through the conjunctiva at the inner and outer canthi and directed well back toward the apex of the orbit. With the exception of enucleating he injects along the external rectus, going well back and aiming at the posterior pole of the eye, thus catching the ciliary nerves and perhaps the lenticular ganglion. About twenty minutes after the injection one can operate. In glaucoma the dilation of the pupil must be combatted with eserin. When operating on the lacrimal sac he injects along the line of the skin incision, and also as near the anterior ethmoidal foramen as possible, in order to catch the infratrochlear branch of the nasal branch of the first division of the fifth nerve which supplies the lacrimal sac.

Duverger uses novocain for local anesthesia in operations on the muscles, extirpation of the lacrimal sac, suborbital and nasal operations. He uses it subcutaneously in two solutions:

(1) 1:100—
Novocain, 2 centigr.
Adrenalin, 2 drops.
Distilled water, 2 ccm.

(2) 4:100—
Novocain, 8 centigr.
Adrenalin, 2 drops.
Distilled water, 2 ccm.

Duverger insists that the technic of detail in operation and use of the solutions be carefully worked out according to his method to insure deep anesthesia and bring about the best operative results.

Ansenn employs bichlorhydrate isoethylhydrocuprein "vusine" for deep anesthesia in operating after injury. He compares the effect of this anesthesia on 100 patients with 220 patients treated with other anesthesia. He thinks the incision of infected tissue much easier with "vusine" and prefers using one part of "vusine" with thirty of gum Arabic. His technic demands careful execution, and plenty of time must be given to saturate all the layers of the muscles, the connective tissue of the conjunctiva, and the perivascular periosteum. Ansenn thinks this treatment lessens danger of infection, the wound beginning to heal normally in three days.

Wolffberg gives a "false narcotic" in removing foreign bodies from the eyes of young patients. If they prove unruly, he suddenly says, "Since you will not behave yourself, I shall have to chloroform you." He puts a few drops of spiritous liquid or benzine on a handkerchief or bit of gauze and commands the patient to hold it tightly to his nose and then to count "one, two, three". While the patient is counting the eye is opened, and with the cornea perfectly still the foreign body is removed from the surface without any difficulty.

Instruments and Apparatus.—Verhoeff describes a lamp which he devised for eye operations. The lamp consists essentially of a 6-8 volt nitrogen, tungsten, automobile, electric bulb enclosed in a case, the light from which is focussed by two convex lenses. The details of how to construct the case are given clearly, so that anyone with mechanical skill can make it. (See A. J. O., v. 2, p. 53.)

Kirkpatrick recommends a light such as is used on a headband by laryngologists as an efficient and portable operating lamp. These are parabolic mirrors carrying a small electric lamp on a movable arm, which allows the intensity of the illumination to be altered.

Andrews uses an ordinary flashlight, to which has been added a sliding brass tube, carrying at one end a planoconvex lens by means of which the rays of light may be changed to suit. A strip of felt envelopes the barrel, which facilitates its movement in the tube. (See Fig. 4.) A core of wood replaces the flashlight battery and carries the wire that connects the lamp with a 710 "Ever-Ready" five-celled battery. The lamp used is a 6.2 V tungsten. The lid of the receptacle has a bayonet fastening which insures contact with the battery. A Bryant, Jr., flush in the lid of the receptacle receives the plug.

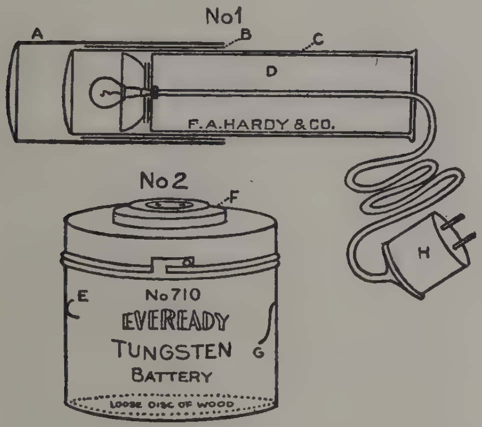

Fig. 4. Andrews' apparatus for lighting field of operation. A brass tube with plano-convex lens. B felt jacket. C tube of flashlight. D core of wood. No. 2 battery. E brass case. F flush receptacle for plug H.

Harman has devised a new spud to lift the foreign body from the eye. On the usual metal handle is mounted a steel stem, and this terminates in a small angled piece of steel. This end piece is shaped like a plano-convex lens; it measures 2 mm. in diameter, and is set at an angle of 45 degrees to the line of the stem like a laryngoscopic mirror, and the surfaces are placed so that the plane looks toward the handle and the convexity away from it. The edge of the steel end-piece is ground as finely as the shape allows.

The method of using it is as follows: After the usual preparation for removing a foreign body the spud is directed vertically to the corneal surface, with the edge of the end-piece as close to the foreign body as possible. Gentle pressure of the spud on the cornea will cause the convexity of the end-piece to depress the corneal epithelium below it. A forward movement of the instrument from this position will lift off the foreign body clearly and without abrading the epithelium.

Dressings.—In a case where it becomes imperative to occlude the sight of one eye without using a regulation monocular bandage, **Selz** finds the following bandage useful: A piece of gauze from 6 to 8 cm. broad is cut to fit the circumference of the patient's head. From the folded side a sliver is cut so that the piece resembles a letter H. At the point where the bandage touches the eye there are four folds of cloth instead of two, forming a slight compress with the advantage of not being in danger of slipping.

Lopez takes a fairly wide piece of adhesive plaster and cuts it out to fit around the eye, then the lower ends are brought up to form a funnel. The device protects the clothing of the patient during irrigation of the eyes.

Special Operative Procedures.— Finnoff describes the reconstruction of the eye as practiced at the Queen's Hospital, Sidcup, England. The most simple and practical device used in construction work is the so-called "Stint" graft or epithelial inlay. The technic is as follows: The scar tissue is dissected from the surface of the wound and a cast of the wound is made with Stint's dental modeling compound. Strips of skin similar to those used in a Thiersch graft are taken from some part of the body and wound smoothly around the dental moulding compound, with the external surface innermost, which leaves the cut surface so that it will come in contact with the wound. The cast, with envelope of skin, is then placed into the wound, and the skin edges are brought over it and sutured. In four or five days the sutures give away and the cast can be removed. The transplanted skin, which has been held in perfect apposition with the surface of the wound, is by this time perfectly healthy and in place.

Pichler discusses the suturing of delicate epidermal grafts. He contents himself with very few stitches, but presses the graft down onto the margins of the conjunctival wound and then inserts a Müller prothesis. Epidermal grafts are often thin and easily torn by forceps, and are often not penetrated by the needle, but slide along with it. Therefore, Pichler has employed for a long time a forceps having a ring-shaped end like a Landolt's "broken ring" test. The graft is stretched on this forceps without injury to it and the needle penetrates it easily and certainly.

Löwenstein describes a tongue-shaped graft, with lateral interrupted sutures to relieve tension, in Kuhnt's conjunctival plastic operation. He used this graft many times in cases in which it was not possible, on account of lack of equipment, to locate the perforating body that caused the wound of the cornea. These cases were then sent to a hospital further back from the front to be better treated.

The operation is as follows: A tongue-shaped slice of the conjunctiva most directly adjacent to the wound of the cornea is prepared for grafting. It is always made sufficiently long to allow for a normal amount of shrinkage and retraction, and is cut as thin as possible. After cutting the conjunctiva close to the corneal margin at the place nearest the corneal wound, two outward incisions are made away from the cornea into the ocular conjunctiva. At the most unfavorable site, the vertex of the cornea, these outward incisions need not be more than 8 mm. long. The width of the conjunctival incision depends on the location and extent of the corneal wound. If the corneal wound is near the margin of the cornea the graft can be narrower, but if toward the center the graft must be correspondingly wider. A graft about 10 mm. broad will, in most cases, suffice to stretch across the diameter of the cornea.

The graft is brought forward and stretched so that each edge overlaps the corneal margin. A stitch is then taken through the angle of the graft into the ocular conjunctiva below it. The graft must cover the wound comfortably. At intervals lateral stitches are taken to fasten the conjunctiva to its new position on the eyeball; these insure a smooth, rapid growth of the conjunctiva to the eyeball and prevent undue drawing at the site of the initial sutures.

The effect is excellent, the insertion of a lead sheet is superfluous, and the end result is at least as good as that of the Kuhnt operation.

Postoperative Infection. — Patton calls attention to a very practical subject and one worthy of careful consideration by all ophthalmic surgeons. Stated in his own words, "If infected tonsils can cause irritation in an eye whose resistance is lowered by embolism, vascular changes, or special susceptibility, as suggested by Brown and Irons, it is quite evident that a similar condition can ensue if the reduction in resistance is traumatic." After reviewing the literature and relating his experience, he gives the following conclusions: (1) Inasmuch as ocular inflammations do occur in the presence of and apparently secondary to certain foci of infection, it is reasonable to conclude that a traumatism, whether operative or accidental, in the presence of a similar focus could light up or be followed by an unusual degree of inflammation. (2) Although it is frequently the tendency on the part of all of us to underestimate the value of new and popular theories, the average patient will agree that an eye is of much greater value than teeth or tonsils, especially when definitely proved that they are diseased. (3) This being true, it is our duty as oculists to promptly remove or correct such foci of infection before subjecting our patients to operative procedures.

Refraction

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This section reviews the literature of 1919, referring to optics, refraction and accommodation of the eye, and the general subject of lenses and their practical use.

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DIGEST OF THE LITERATURE.

Optics.—Sheard writes upon diffraction in the human eye and the phenomena of colored rings surrounding luminous sources. His conclusions are that colored rings and coronas surrounding luminous sources, under fairly favorable conditions of observation, are practically universal. These rings are due to the diffraction of light by the constituent parts of one (or more) of the ocular media. The first ring (which is commonly the only one seen), is due to diffraction by the cells of the anterior epithelial layer of the cornea, or possibly to the endothelium of Descemet's membrane (Druault). The second ring is evidently due to diffraction by particles of a smaller size than those which produce the first ring. The writer suggests the inner layer of the anterior epithelium of the cornea as the cause. This ring has been attributed by Druault to the lens fibers; but reasons are advanced that such a view is not probable. The ciliary corona is due without doubt to the lens fibers, and the striae to the lens star.

The influence of chromatic aberration on the resolving power of the eye is the subject of a paper by **Hartridge.**

Southall's "Text-Book of Geometrical Optics" contains in its 15 chapters a very complete account of the subject. Considerable familiarity with mathematics is necessary for the intelligent reading of the work as a whole, especially algebra, geometry and trigonometry. The scientific ophthalmologist who desires more than a superficial knowledge of this subject, will find this a satisfactory work for his purpose. Some parts can be read to advantage by one conversant only with elementary mathematics; but the serious student must bring to it a working knowledge of more, even though the methods of the higher mathematics are not necessary.

The "simplified method" of tracing rays through any optical system expounded by **Silberstein** is based on quaturnians and vector analysis; branches of advanced geometry and algebra with which few ophthalmologists are familiar. The vector is the conception of a line having fixed length and fixed direction, but no fixed position in space. **Pauli** and **Pauli** have written a treatise on physiologic optics for the use of general scientists.

Tscherning points out methods of measuring spectacle lenses, especially menisci. The latter should be numbered from the vertex of the posterior surface of the glass to the nearest principal focus. He describes in detail the apparatus and procedures which he employs for the exact measurement of lenses or optical systems; viz, focal distance, curvature of surfaces, index of refraction, field, astigmatism from oblique incidence and orthoscopy. **Boegehold** has written on astigmatic and orthoscopic spectacles pointing out the amount of astigmatism occasioned by looking obliquely through them.

Fison gives a table showing the distances of the first and second focal lines of a small cylindrical beam of parallel rays passing obliquely through the center of a symmetrical double convex lens of 100 c.m. focal length. The mathematical demonstration can not be given here, though it involves no higher mathematics than plane and spherical trigonometry. A short summary of what is meant can be rendered intelligible, however, without going into the details of the demonstration.

When a beam of parallel light of small section is incident upon the center of a convex lens along the direction of its axis, it converges, after traversing the lens, to a sharp focus.

When the direction of the beam, whether it traverses the center of the lens or not, is oblique to the axis, the rays are no longer focussed at a point, but in two short lines (focal lines). One of them, the first focal line, is at right angles to the plane determined by the axis of the beam and lens, while the other, the second focal line, lies in this plane. Both focal lines are nearer the lens than its focus for axial rays, so that the focal length of the lens is reduced and its power increased for oblique vision. Further, the lengths of the focal lines and consequent deviation from direct vision, increase with the obliquity. The table gives the distances of the two focal lines from the center of the lens at inclinations of the beam to the axis, increasing from 0° to 30°, at 5° intervals. The focal length of the lens being 100 c.m. for rays along the direction of the axis, the distances of the two focal lines respectively, will, as stated, be shorter; for the first focal line, the distance at an inclination of 30° being 67.53 cm., while that of the second at the same angle equals 91.2. The shortening of the focal length of the lines is naturally less for smaller angles of inclination.

Henker has devised an instrument for measuring the accuracy of lenses, both during direct and oblique vision. The formulae and diagrams of the instrument are given in the original paper. He also figures an apparatus for illustrating vision through well and ill constructed spectacle lenses.

Henker calls attention to the fact that the vertex refraction of the image region of the toric lens may differ from that of the trial lens bearing the same number in diopters. The ordinary methods of measuring the strength of the vertical refraction (phakometer, neutralization) are not suitable for toric lenses. The distance of the vertex of the toric lens from the cornea may differ from that of the trial lens; such difference must be taken into account in the case of lenses above 6 D. In consequence of the diminished curvature of the field of toric lenses, the refractive power is somewhat weaker at the edges. Accordingly, under certain circumstances, a somewhat stronger lens must be ordered than the one found with the test case. Care must also be taken that the person under examination looks directly through the center of the trial lens during the examination. The vertex refraction in the two principal meridians of a sphero-cylindric combination differs from the sum of the two components, if the latter are of any considerable strength.

The same writer has devised an apparatus for measuring the **vertex refraction** of lenses. He claims for his instrument that its use will not entail an error greater than 0.1 D. The advantage of such an instrument consists in the important fact that it gives the real strength of the lens and this is the sole point of moment to the wearer. It also measures lenses bounded by one or two aspherical surfaces. It gives too, the vertex refraction of compound systems as quickly and accurately as of a simple spectacle lens. Hence the instrument is of value in determining the refraction, and, therefore, the focal distances, of photographic objectives, thus determining the length of the camera. Diagrams showing the mechanism of the instrument accompany the article.

Dixey observes that it has been frequently noted that light passing obliquely through a spherical lens, experiences cylindrical refraction, but it is curious that this is only commented on in relation to the vertical axis. Although this is obviously of superior importance, the effect is no less applicable to the horizontal axis, and to intermediate directions. This would suggest a preference for a toric form of lens, and the advantage of the small round form of disc in a bifocal lens, rather than one of extended lateral shape.

Skiascopy.—Marquez writes a brochure of 66 pages upon the theory and practice of skiascopy with both concave and plane mirrors. He concludes that the method is rapid and almost exact; but not quite to the degree of mathematical accuracy attributed to it by its enthusiasts. It remains, nevertheless, an interesting and useful procedure, and shortens considerably the subjective examination. The latter however, is indispensable for complete clinical measurement of the refraction.

[In this connection the reviewer would add that, while the subjective examination has been termed the "court of last appeal", it is to be remembered that a court of last appeal has the testimony and findings of the lower court before it; and so the subjective examination being based, as it should be, upon antecedent objective measurements, is in a far better position to reach an accurate conclusion than if reliance be had upon this alone. In other words, the subjective measurement should always be based upon and supplement the objective: the two are not antagonistic, but complementary to each other].

The writings of "optometrists" use the term dynamic skiametry to indicate skiascopy applied with the eyes fixed upon a relative near point either the plane of the observer's eye or somewhat closer or farther away than this. **Sheard's** article of 105 pages gives an elaborate account of this method of diagnosis which is chiefly valuable as an objective test of relative accommodation and convergence. He points out it is always a binocular test. The object for the patient to fix upon, small letters or a group of dots, may be attached to the mirror or may be mounted upon separate stands. It is a method always applied without cycloplegia and generally without any mydriatic. Sheard illustrates the subject with illustrative cases and numerous cuts of apparatus and diagrams. **Pavia** has written upon this subject under the title dynamic retinoscopy.

Wolff writes a lengthy paper upon the shadow test. The article contains numerous diagrams in color and a comparison of the results of skiascopy with the subjective test in 393 cases, each separately tabulated.

Newcomb describes the refraction methods employed in the Department of Ophthalmology of the Attending Surgeon's Office, U. S. Army, Washington, D. C. A convenient testing card is used for noting the subjective and objective conditions. A solution of homatropin, hydrobromate 2% and erythroxylon hydrochlorid 1%, 1 drop every ten minutes for 1 hour, followed by a myotic at the end of the examination, is employed in every case where there are no contraindications. Skiascopy is employed in every case. A 60 watt frosted Mazda lamp, so jacketed as to shut off all light from the patient's face, is used as the source of light; it is placed between the patient and the operator, who should accurately maintain 1 meter's distance between the eye under examination and the skiascope. When astigmatism is present the sphero-cylinders should be employed. For the subjective tests, instead of the astigmatic charts a checker board chart is used; the cylinder found by skiascopy is placed at right angles to its proper axis; this will result in a very decided blurring of the squares of the board; the cylinder is then turned until the black and white squares appear clean cut. It need hardly be said that the above method is also applicable in the ordinary refraction work of civil practice.

Lindner observes that most ophthalmologists regard the subjective test as of greatest importance in the determination of astigmatism. Skiascopy, if employed at all, is regarded simply as a time-saving help (this, of course, is meant for Germany). As a matter of fact, however, skiascopy offers the most accurate objective method for the exact measurement of regular astigmatism, but the test should be applied in the proper manner. The usual method involves several sources of error; the measurement is not made at the macular region, and secondly the separate skiascopic determination of the two principal meridians is unreliable, for the reason that the patient, may, by means of the accommodation, even when under atropin, modify the refraction in the interval between the two measurements. In high degrees, moreover, the results of such measurement of the two meridians will not be sufficiently accurate.

These sources of error can be avoided by having the patient fix the mirror and making the measurement by placing before the eye suitable spheres and cylinders to bring the point of reversal to 1 meter. In this way the entire astigmatism may often be measured by means of the mydriasis obtained by cocain alone without paralyzing the accommodation, but homatropin should be employed as a rule. The fear that by its use, the true astigmatism may suffer a change is not well founded, series of examinations having shown that the astigmatism remains unchanged by use of that drug. In the case of older subjects in whom dilatation of the pupil is alone desired, cocain and homatropin in combination (three and one percent respectively) is suitable. The writer states that this method was recommended by Chibret in 1890, Lambert in 1894, Jackson 1895, Duane in 1903, and Pennell in 1912. It is not the method usual in Germany, but it surpasses in accuracy in most cases every other method.

Subjective Tests.—Gardiner makes a plea for greater accuracy in refraction work. Carelessness and ignorance, both of which are apt to result from slavish reliance upon mechanical devices for measuring refraction and muscle balance, are prime factors in this unfortunate result. So also is the practice of some oculists of delegating this part of the work to incompetent and inexperienced assistants, or to eliminating the use of cycloplegics in measuring the refraction of young persons. As a cure for this state of things, he advocates a prolonged course of study—one year or more, such as is furnished by the University of Colorado School of Medicine and the Minnesota University Medical School. The cooperation of the medical profession at large is indispensable in the encouragement of the worthy and competent as against those who are not.

Pyle insists upon the necessity of all possible accuracy in the correction of errors of refraction. Approximate correction may aggravate rather than relieve asthenopic symptoms by allowing the ciliary muscle to compensate uncorrected refractive defects, before impossible, and so establish continuous rather than intermittent eyestrain. He describes the proper arrangements and instruments for attaining the best results, such as the examination room, test lenses and lens testing devices, test charts, objective methods, of which he considers retinoscopy the most convenient and reliable, but only suggestive and not accurate.

Cycloplegics.—Sumner from considerable experience sides definitely with the champions for a cycloplegic in refraction in the majority of cases. His own observation has been that when properly administered it will paralyze the ciliary muscle in at least 80 per cent of cases. In a few cases the muscle becomes active within twenty to thirty minutes after the last drop. It is therefore essential then that refraction shall be measured immediately. He uses a 2 per cent solution instilled seven times within an hour.

Craig reports a case of poisoning by homatropin in a girl aged 5½ years. Two years previously atropin, 4 grs. to the ounce, had been used twice daily for three days with no symptoms whatever of belladonna poisoning. Two years later a drop of solution of homatropin, 4 grs. to the ounce, was instilled in each eye; two hours later the child was in a condition of intense mental excitement, laughing, talking incoherently, and with hallucinations of vision. She also complained of dryness of the mouth. The excitement continued without abatement for ten hours, when she fell asleep. On waking five or six hours later, her condition had become normal. The same solution has been frequently used since without unusual effect, except that in one or two instances a slight sensation of giddiness was complained of with dryness of the mouth, suggesting that impurity of the drug may, in some degree, account for the facts of the case.

Hyperopia. — Gardiner summarizes from Pepys' Diary by D'Arcy Power, Pepys' own account of the suffering and disability caused by his eyes, which finally resulted in almost complete abandonment of all near work, including the prosecution of the diary, at 36 years of age. Mr. Power concluded that Pepys' ametropia could have been corrected by + 2. + .50 cy. ax. 90. Gardiner reports the case of a patient with asthenopia from early youth. When the reporter saw him he was wearing + 2., giving vision of 20/20 and + 2.75 for near. Examination showed the refraction to be R. + 2.D + 0.25 cy. ax. 120° L. + 2. + 0.25 cy. ax. 45°. This correction gave complete relief. The patient wrote: "It is truly tantalizing to realize at my age that my life has been ruined and all my ambitions shattered by an astigmatic error of a quarter of a diopter".

Payne bases his views upon a study of the functions of the ocular muscles and the accommodation, and illustrates them by a large series of cases. He seeks to show that heterophoria, astigmia and myopia are all developed under the strain of uncorrected hyperopic refraction.

Shibuya has written on lowered visual acuity and low hyperopia. The share of the crystalline lens in the refraction of the eye is the subject of a paper by **E. Landolt**, who considers the changes produced by the removal of the lens in hyperopia and myopia of various degrees.

Myopia.—Ochi experimented upon young rabbits by inserting small foreign bodies beneath the recti muscles, with a view to producing continuous pressure upon the eyeball, to discover what influence, if any, such pressure might have upon the diameters of the globe. No marked changes were found. He next subjected the antero-posterior diameter to stronger compression by binding the equator of the eyeball of young rabbits with silk threads instead of wedging in a foreign body. As a result of these experiments he concludes that even pretty strong continuous compression upon the eyeball can not greatly lengthen its diameter. Therefore it seems likely that the pressure of the ocular muscles alone upon the wall of the globe can not greatly change the antero-posterior diameter, if the wall is normally strong. But if the resistance of the sclera is weaker than normal, even the compression of the ocular muscles alone could lengthen the antero-posterior diameter. To this pressure upon a weakened sclera he ascribes the development of juvenile progressive myopia.

From a study of the structure and development of the sclera, he suggests that the sclera is to be regarded as a part of the cranium. Such correspondence may serve to explain why some scrofulous weak children may have a predisposition to progressive myopia. These considerations have a direct bearing upon the prophylaxis of progressive myopia. In children with weak constitutions, attempts must be made to strengthen the skeleton, and with it the sclera. Unhygienic exhaustion of the eyes in children, whether they have a predisposition to myopia or not, must be guarded against; because unhygienic use of the eye can result in excessive compression of the ocular muscles upon the wall of the globe, which is not yet strong enough to withstand it.

Commenting upon the above relation of the sclera to the skeleton, **Jackson** observes that the suggestion is worthy of investigation that may have very practical results in improving the management of myopia. The development of myopia needs to be considered broadly; there has been too much theoretic argument and not enough careful and exact observation. In the developing myopia of the young, a number of questions present themselves:

such as the possible presence of astigmia, excessive convergence, the existence of sclero-choroiditis, vascular or nasal disease, evidence of defective nutrition in other directions, particularly of skeletal and connective structures. The reply to these questions may lead to assigning to each factor its proper share in the result.

Thomson presents some statistics of myopia in school children from the county of Lanark, Scotland, the city of Glasgow being excluded. The reporter roughly divides the district studied into two main parts, urban and rural. From 1914 to 1917 he examined 3,249 children belonging to both parts. Of these 18.8 per cent had myopia or myopic astigmatism in one or both eyes. Of the urban cases, 2,655, 17.6 per cent, were myopic; while of 594 rural cases, 24.2 per cent were myopic. Further classification and subdivision of the material led to a corresponding result, i. e., preponderance of myopes in the children of agriculture when compared with those of industry.

These results are at variance with the view that myopia is less common in the country than in the town; that it is a disease of the educated and of those who use their eyes largely at close range. An investigation as to the mean myopia in the different districts does not seem to point to any striking difference between the two respectively. There was no evidence of any particular difference in the type, high or low, in the two. There appeared to be a tendency for the myopia to be higher in the right eye.

As regards the occurrence of squint in myopic children, 74 (9 doubtful) out of 790 myopes examined showed squint, of which 45 were convergent and 29 divergent—a result opposed to the commonly accepted view that divergent strabismus is the ordinary type of squint in myopia. It may easily be supposed that in myopic children a convergent squint may change to divergence and thus explain the presumed greater number of divergent squints in myopic adults.

In connection with the above paper, Wilson recalls some work of his own upon the same subject.

Levinsohn returns to the question of the causation of myopia and insists that his experiments upon animals prove that the bending forward of the head and neck is the essential factor in the causation of myopia, whatever be the explanation. For such experiments upon animals will bring about myopia with all its typical changes—a fact which in his opinion is decisive. **Risley** has written on the genesis of myopia.

Beckers has urged the importance of astigmatism as the cause of myopia, and **Wolffberg** writes on the visual capacity of myopia.

Rönne, writing on conus formation and excessive myopia to the nasal side of the optic disc, admits that posterior staphyloma may be either of congenital or pathologic origin. In his paper of 68 pages on myopia and its varieties **Menacho** suggests 7 methods of classifying cases. These are (1) anatomic, axial, of curvature, of index, and of cranial configuration. (2) Chronologic: congenital and acquired, the latter either in childhood or later life. (3) Etiologic, primary, congenital as myopia or astigmia, scleral aplasia, lenticonus, etc., consecutive to use or from lesions of cornea, crystalline and deeper coats. (4) By degrees; low to 3 D. medium, 3 to 6 D., high, 6 to 15 D., very high above 15 D. (5) Essential and apparent (spasmodic) (6) By its course; benign which he calls typical; malignant, or atypical. (7) Clinical stationary or progressive, either benign or malignant.

Koster calls attention to three rare forms of myopia: The first, which he terms cyclitic myopia, is due in his opinion to a chronic cyclitis which develops soon after birth. As a consequence of such inflammation, the coats of the eye become less resistent to the intraocular tension, at first normal, but later somewhat raised through the exudate. This form of myopia never reaches an excessive degree as there are no marked changes in the funds, and the tension diminishes in time. The vitreous shows not the large flocculi of progressive myopia but a diffuse or dust-like opacity. The vision is also apt to be lower in the cyclitic form than in the progressive of the same degree. A second form of myopia results from stationary buphthalmos, which is simply infantile glaucoma. The third form is of congenital or optic origin without pathologic changes. The degree remains stationary or but slightly progressive in early childhood. It varies between 1 and 10 D.

Suganuma examined anatomically 6 myopic eyeballs of which 4 had wide temporal conus and one a ring shaped atrophy, and staphyloma of 3 mm. In 5 the tissues were greatly stretched causing the myopic crescent. The temporal border of the choroidal opening being widely removed from the optic nerve. The retinal pigment epithelium was atrophied in most cases about the disc. In all cases the retina was adherent to the choroid. In one there was atrophy of the retina in the macular region, the nasal edge of the atrophic spots being thrown up and thickened. The choroid was also atrophied and the elastic lamina broken.

Descola publishes a lengthy but very interesting critical review of Hirschberg's brochure of 89 pages upon the treatment of myopia, which appeared in 1910. A short preface by R. D. (probably Rochon-Duvigneaud) states that Hirschberg's work contains nothing especially new. As the production of a learned and experienced ophthalmologist, it is worthy of consideration, notwithstanding that it contains a certain number of preconceived notions and unproven affirmations. Being a resumé it does not lend itself well for a review but should be consulted in the original.

It may be of interest to cite the concluding paragraph with which Hirschberg crowns his work: "We must make a certain amount of sacrifice to our Kultur. . . . One consolation remains to us: the inexhaustible force of the German people; in scientific literature certain foreigners (happily few in number) and particularly short sighted, have misconstrued this people in a very unfriendly fashion, as also the powerful collective effort of so many men of judicious judgment in government direction of schools. . . . The German people is so solidly constructed at bottom that new strata always arise to support the requisite Kultur."

Treatment of Myopia.—Pichler reports a case of low myopia, 0.25, in which the vision was raised from 10/18 to 10/10 by a red plano-glass, giving a better correction than any white concave lens. He ascribes the improvement to the filtration of the more refractive short wave rays, allowing only the passage of the less refractive red light rays which, in the case of myopia of 0.25 D., are united in a focus at the most favorable point upon the retina; in other words, the chromatic aberration of the eye serves, by means of a color filter, for the correction of the vision.

Bardsley, based largely upon personal experience, argues against the full correction in myopia. His preference is for bifocals, but not of the ordinary pattern, because of the distortion of the image. In the ordinary bifocals when the upper glass is set at right angles to the visual axis, the tilt of the lower glass comes between 20 and 30 degrees, the latter entailing a cylindric effect of 0.31 D. for each diopter of the sphere. To overcome this cylindric effect, the writer angles the bifocal. The difficulty the author encountered was to bring the edges of the upper and lower glass into continuous contact; this was overcome by grinding a toric curve on the upper lens, and a double concave or convex on the lower. Certain faults are inherent in such lenses. To overcome them, an optician, Mr. J. B. Rayner, has found a solution: a thick blank for the invisible bifocal lenses with a reading sphere upon its lower part, is ground off along the line to give the angle of 15 to 20 degrees; on the inner surface the refraction curve is ground common to both lenses. At present these angular bifocals can not be made in convex but only in concave combinations. Mr. Rayner is sanguine that he will discover a method of angling convex circular bifocals.

Commenting upon Mr. Bardsley's scheme of angling the lower segment of a bifocal combination, Henderson suggests that the problem may be attacked in another way. A table could be drawn up showing the effect of tilting lenses of various strengths to an average reading inclination of 25 degrees; a cylinder could thence be ground for the lower segment of the bifocal sufficient to neutralize the cylindric effect produced by the tilting. This method would be applicable to convex and concave lenses.

Blegvad has written on the full correction of myopia, and **Ziegler** upon Cohn's theory and the importance of lessening near vision. **Raefler** has discussed the correction of myopia with telescopic lenses.

In connection with Henderson's suggestion concerning the altered effect of spherical lenses when tilted, **Howard** has constructed a table showing the effect of various powers of lenses when tilted through, 15, 20 and 25 degrees.

Upon the same subject **Percival** warns of the danger to myopes of rotating their eyes downward when reading: the page should be raised to the level of the eyes. He gives this warning against bifocals in myopia, though an enthusiastic advocate of such lenses in hypermetropia. He thinks Bardsley has been troubling himself over a very simple matter. If bifocal pince-nez are used, every wearer instinctively adjusts them so that his visual lines traverse them normally; and if spectacles are worn, it is a very simple matter to raise the temples a trifle so that the lenses are tilted sufficiently to meet this requirement.

An elaborate paper on the treatment of intraocular complications of high myopia by subconjunctival injections of salt solution has been published by **Mallwitz.** He reviews at length the reported experience of others. His own experience includes 28 cases of which 22 presented macular changes, 18 vitreous opacities, and 11 marked conus. In 75 percent the treatment was followed by clear improvement of vision, 21.5 percent remained unchanged, and 1 case became slightly worse. In the tabulated cases the improvement of vision was generally what would be represented by one line on the test card. The solution used was physiologic and occasionally as strong as 2 percent. Injections were repeated six or seven times in the course of two or three weeks. Two hours after injection the eye was kept under a compress. The amount used corresponded to 4 or 5 divisions on the Pravaz syringe.

During the war persons with high myopia were called to the colors in many cases in Hungary (and no doubt in the armies of the other warring powers as well). **Wätzold** raises the following questions: Is it possible for military service to aggravate existing myopia? To what extent are injuries received in the service responsible for recent changes in the fundus? The writer concludes as to the first question that aggravation is only to be considered as the result of prolonged clerical activity, but not from the usual duties at the front. The second question cannot receive a general reply: each case must be judged upon its merits. In this connection it may be laid down that individuals with known progressive fundus changes should be rejected, or employed only in such service as differs little from their duties in civil life, and in which corporeal exertions are to be avoided so far as possible.

Anisometropia.—Landwehr investigated 72 cases of anisometropia as to the conflict between the visual fields of the two eyes, the localization of direction in the fields and the perception of depth. With reference to the first he found one or both of the eyes being myopic that before correction the less myopic eye preponderated in 19 cases, and after correction in 4, and that in the cases in which the less myopic eye prevailed it also had the best acuteness of vision; and in general the lower ametropia and the better vision determined the prevailing eye. To estimate the certainty and accuracy of localization in different parts of the field he used the apparatus of Roelof. These observations show that the more ametropia eye and the one with lower acuity was at a positive disadvantage showing the greater uncertainty of localization in the direction of the fixation point. But when the right half of the field the right eye, and in the left half of the field the left eye, seemed better to perform the function. Only in case of markedly greater ametropia or worse vision was there deviation from this rule. The investigation of depth perception was carried on by means of Hering's drop test. This showed that with anisometropia of less than 4 D. there were very few failures to recognize the relative distance. But that above 4 D. they were comparatively numerous.

Rijkens details personal experience in his own case of anisometropia following cataract extraction of the left eye. The refraction of R. is — 1. — 1.50 cy.ax. 150. L + 9. Ordinary correcting lenses could not be worn because of the resulting diplopia. This vanished entirely when a combination suggested by von Rohr was obtained, of which the aphakic component consists of two convex lenses in contact and a third double concave separated by an interval from the convex components.

Erggelet proposes an experimental method of studying anisometropia by means of an instrument which he calls a vari-projection apparatus, through which one eye looks perpendicular to the plane of the picture while the other sees it indirectly with the aid of the mirror.

Changes in Refraction.—Following a discussion of the changes, physiologic and pathologic, in their influence upon refraction, **Zimmermann** details the changes in refraction in a male from his 52nd to 81st year. At 52 the refraction was emmetropic; in the 64th year, myopia developed and incipient cataract, at the peripheral cortex of both eyes. Vision was corrected by R. — 3.50, L. — 1. At 65, Vision, R. = 22/100, L. = 21/100; the myopia had increased and was complicated by astigmatism. The ophthalmometer showed R. — 1. cy. ax. 180°, L. — 0.75 cy. ax. 180°. V. was corrected with R. — 5. — 0.50 cy. ax. 90° = 20/30; L. — 1. — 2. cy. ax. 90° = 20/20. In certain positions of the ophthalmoscope, the fundus of each eye was clearly visible; in others not, on account of sclerosis of the nucleus of the lens. The peripheral opaque spokes had not changed much. Anterior chamber shallow; monocular polyopia.

In the years following, the spheres and cylinders had to be increased, vision gradually decreasing under correction. At 70, the myopia reached its maximum, viz: R. — 10. — 2. ax. 90° = 20/100; L. — 6. — 4.50 cy. ax. 90° = 20/50 —. At 72 V. was the same with the above correction. Without correction, fingers at 6 ft. The ophthalmoscope showed R. good reflex, but dimmed in the center by the sclerotic nucleus; details visible; no changes in retina; cataract not progressed. L., same picture of sclerosis with slight opacities at equator. Sugar first discovered in the urine, but not thought to be responsible for the change in the lens.

At 75 fundus details visible in L. eye but not in R. Sclerosis of nucleus increased; swelling of lens decreased as shown by deeper anterior chamber and also refraction, which was now: R. — 9. — 1. cy. ax. 90° = 20/100; L. — 6. — 3.75 cy ax. 90° = 20/50 —, same as before. No changes in the next four years. But at 79 further decrease in myopia and astigmatism to R. — 7. = 20/100, L. — 5. — 2. ax. 90° = 20/50. V. with this correction fell to R. 20/200 —, L. 20/70. R. showed faint red reflex, some opaque cortex on temporal side, clear on nasal side; nucleus opaque. L. cortex pretty clear, except a few spokes, nucleus diffusely opaque, details of fundus faintly visible. Reads with R. — 2.50 large print; L. — 2. cy. ax. 90°, Jaeger No. 1 at 6 in., No. 2 at 9 in., No. 4 at 11 in. Reads many hours with the above with comfort.

Permanent changes in refraction following eye wounds have been frequently observed (e. g., after luxation of the lens, meningeal cicatrices, etc.). Of greater interest and less frequently seen are the cases in which, following injury, changes of refraction occur which present marked variations during treatment and finally vanish entirely, so that the injured eye attains the same refraction as was present before the injury. **Rosenhauch** observed several such cases, in which myopia developed after injury. He explains such development by increased curvature of the lens following rupture of the zonula; he thinks that the gradual disappearance of the myopia is due to subsequent contraction of the cicatrix. In one case, the myopia was first noticed after injection of normal salt solution to replace loss of vitreous; in this case the myopia, in consequence of increased curvature of the lens, was compensated by recession of that organ from loss of vitreous. **Sakai** has written on Berlin's opacity and traumatic myopia, and **Louis** on changes in refraction in relation to occupation.

Lundsgaard has reported several cases of temporary myopia—in one case as high as 8.5 D. which disappeared in a few days. Some of these patients had just recovered from influenza; and others had a rather high sugar content in the blood, but without glycosuria. In one case, astigmatism developed with myopia in one eye after a contusion. He attributes the sudden and brief myopia to some change in the curvature of the lens.

Astigmia.—Henker has constructed models to illustrate astigmia of pencils falling obliquely upon a refracting system, 13 illustrative diagrams are used in his paper.

Clegg discusses the recommendations made by the committee of the International Congress held at Naples in 1909 for the standardization of notation in astigmia and other methods suggested and in use. He obtained the prescription forms from 126 hospitals in Great Britain and Ireland, showing considerable deviations. He finally suggests in the interests of uniformity that the so-called standard system should be adopted. He figures this in 3 forms; the one recommended employs the inferior semicircle, practically the one in common use in the United States. Although asymmetric, it has the great advantage that the degree number is the same for both eyes. It is purely mathematical.

While it does not conform with the anatomic idea of symmetry, such theoretical considerations will have to be waived if the easiest path to uniformity in Great Britain and America is to be taken. (The writer states that in the American edition of "Fuch's Ophthalmology" the prevailing system in this country is the standard, with the axis number appearing upon the upper semicircle. So far as the reviewer's observation goes, the upper use in this country, but the lower with zero at the left hand extremity of the horizontal diameter of each eye as the observer looks at the patient. This brings the starting point, zero, to the temporal extremity of the horizontal diameter for the right eye and the nasal extremity for the left).

Greeff reports the conclusions formulated by a German committee named by representatives of the different interests, scientific and manufacturing, concerned with the method of numbering the axes of cylindrical lenses, which met in Berlin in 1916, for the purpose of introducing uniformity in the matter. The suggestions of the Congress at Naples in 1908 had led to no satisfactory results. The committee was unanimous in the view that the degree bearing arc should be the same for both eyes. The numbering should extend from 0 to 180°, preferably from R. to L., counterclockwise, as is the practice in mathematics.

Henker emphasizes the importance of a single standard of notation for numbering the axes of cylindrical lenses and that this had best be the method employed in mathematics. The double system of the international scheme involves decided disadvantages to the manufacturer and frequently leads to errors. In Germany alone 100,000 lenses at least are wasted; ophthalmologists are accordingly asked to employ the mathematical system. **Raum** has also written on this subject. Practically nothing is now brought forward that was not considered more than ten years ago by the Committee of the International Ophthalmological Congress, at Naples. (O. Y. B., v. 7, p. 88).

Boegehold discusses correction of astigmia by means of sphero-toric lenses. He has worked out formulae and tables, showing under what conditions the best results can be attained. Statistics of the occurrence of astigmatism in 11,704 patients at the Jena University Clinic are reported by **Art.** 15.7% of the eyes showed astigmatism; a proportion very suggestive of inadequate examination for it. **March** observed a case of high myopic astigmatism requiring for its correction R. — 13 sph.

— 14 cyl. axis 7 degrees. V. = 20/50. L. — 12 sph. ⁀ 15. cyl. axis 157 degrees. V. = 20/40. In both eyes the media were clear and the fundi normal.

Irregular Astigmia. — **Gonzalez** reports a case of refraction in keratoconus with high irregular myopic astigmia in the more ectatic zone of the cornea; and with strong hyperopia in the peripheral zones, as shown by the shadow test. The best correcting lenses were R. — 4.— 8. cy. ax. 80°. L. — 4.— 8. cy. ax. 180° raising the vision from .1 to .4. The reporter believes that this patient was congenitally a high hyperope. Efforts at near vision gave rise to corneal malnutrition with bulging of the center, resulting in the myopia of that region with the original hyperopia at the periphery.

Lüdemann has studied the comparative effects of Lohnstein-Siegrist hydrodiascope and Müller's contact glasses in the correction of keratoconus. He concludes that although the former give the best optical results, even raising the vision to the normal, which cannot be accomplished by Müller's glasses, the latter are nevertheless to be preferred on account of the disfiguring effect of the former and the necessity of occasionally dropping normal salt solution between the glass and the cornea. In certain cases the contact glass can be supplemented to advantage with convex or concave lenses worn in the usual way.

Accommodation. Knowledge of the mechanism of accommodation has been decidedly extended during the last few years. Hess's experiments have shown with great exactness the effect of the ciliary muscle upon the form and position of the crystalline lens. Gullstrand went further, in that he showed the intra-capsular mechanism effective during accommodation. Inasmuch as the question has, so to speak, entered upon a new phase, **Erggelet** remarks that an historical sketch may be of some interest.

In Helmholtz's Handbook of Physiological Optics, the views of those who assumed a change in the form of the lens are represented by Descartes (1637), Pemberton (1719), Camper (1746). Another author not mentioned by Helmholtz belongs in the same group between Pemberton and Camper: J. B. Wiedeburg, Professor of Mathematics at Jena, 1735. In his "Introduction to Optics" he expresses remarkable views concerning the extracapsular mechanism of accommodation. He distinctly emphasizes this as against the view that a change in the size of the pupil was alone effective for vision of distant and near objects. Wiedeburg assumes a change in the elasticity of the capsule through the zonula, thus assuming muscular contractions by virtue of which the curvature of the lens surface is increased, adapting the eye for near objects. **Nordenson** has written on the changes that occur in the crystalline lens with accommodation.

Strebel in calling attention to Hess's demonstration of the truth of Helmholtz's theory of relaxation of the zonula during accommodation observes that this deals only with the positive phase of the act, while it neglects the negative one. He undertakes to fill the hiatus. He thinks that to one elastic force another is opposed; and that the latter can only reside in the choroid. The role of the ciliary muscle consists in destroying the equilibrium of elasticity, maintained between the choroid on the one hand, and the zonula and crystalline on the other. This equilibrium is shown objectively by measurement of the coefficient of elasticity of the different segments of the choroid: It is found that this coefficient is constantly three to four times greater in the sagittal than in the transverse direction; it is greatest in the neighborhood of the ciliary body. The attachment of the choroid to the sclera also plays a role. He has constructed two models to illustrate his views.

Murray observed spasm of accommodation, dizziness with severe pain in the eyes and temples, every time the patient looked away from the median line, either to the right, left, or up or down. Vision 20/20 each eye; presbyopia 1 D. exophoria; with + 2 D. he could see 1 meter type at 12 or 13 inches but not beyond or within this range. Tests showed all organs normal except skiagrams of the teeth, which disclosed three large abscesses at the apices and one unerupted tooth immediately beneath the abscess; both unerupted tooth and abscessed teeth were removed with complete and prompt relief to the dizziness and headache.

Lafon observes that up to the end of the last century, ocular disturbances attributed to hysteria were frequent; spasm of convergence and accommodation occupied a large place in this category. But following Babinski's researches, such contractures of simulation have disappeared almost entirely from medical literature; either because they are in reality very rare, or because writers have become too circumspect, or probably for both these reasons. As a matter of fact, reperusal of the report of such cases at the present day leads to the conviction that those of undoubted hysterical origin are but few. The reporter has observed a series of 7 cases among 2,700 hospital patients in 18 months. Before detailing these in extenso, he insists upon the necessity of making the examination with a distant test object, at least 5 meters and not only at or about reading distance, as is commonly practiced. The latter brings in the convergence and thus masks the real condition.

His cases come under several heads: Two were instances of permanent and tonic simultaneous contraction of convergence and accommodation; one was intermittent and clonic. There were two instances of contraction of convergence without spasm of the accommodation and two finally showed spasm of the accommodation alone. All of the cases are reported in detail. He concludes that all seven were legitimate instances of manifestations of simulation. Were they hysterical? He thinks an affirmative reply may be given for the cases of simultaneous spasm of convergence and accommodation tonic or clonic. But the matter is quite different for independent spasm of the two functions. He quotes Polack's observation that some people, particularly artists, are able to contract their ciliary muscle at will and thus bring about a kind of "facultative myopia" without convergence. The writer on the other hand could find no instance of voluntary contraction of convergence without accompanying contraction of the ciliary muscle. He doubts whether isolated contraction of convergence, as in his 4th case, could be simulated, even after much practice.

Wolff reports in a boy of 12, two attacks of paresis of accommodation of unknown origin, each of which was relieved at once by a moderate loss of blood, the first from a nasal hemorrhage and the second from the abstraction of blood for a Wassermann test. **Espino** saw a girl 10 years old who suffered almost total cyclopegia some days after recovering from an attack of diphtheria of the pharynx. The child was given convex glasses for immediate use, eserin locally and strychnin internally. There was complete recovery in three weeks. **Purtscher** reports paralysis of accommodation in a man who had eaten poppy seed noodles. On examination it was found that the poppy seeds contains nearly 2 % of hyoscyamus seeds. **Pattee** saw a case of post-diphtheritic paresis of accommodation.

Clarke notes that presbyopia synchronized with important body changes. The "squeezability" of the lens decreased with age from physiological changes in the lens itself, not due to any weakness of the ciliary muscle, except in advanced age, so that the normal emmetrope at 48 required aid for near work. Presbyopia was felt most at the time when eye strain was most liable to occur. He advocates bifocal glasses and thinks that a common mistake is to make the reading glasses too strong.

Correcting Lenses.—Henker has constructed telescopic combinations for near and distant vision for eyes with poor vision. The instrument is mounted in various ways, such as a fixed stand, with a handle, or brought before the eye like a head mirror. It magnifies from 3 to 6 times for distance. Patients with visual acuity of 1/8 and less generally require 6-fold magnification. A still greater range is possible when the instrument is adapted for near work.

In addition to some general discussion of the telescopic spectacles devised by von Rohr, **Wolff** reports a series of individual cases showing the improvement of vision obtained with them; in anisometropia, clouding of the cornea, lens and vitreous, amblyopia both congenital and acquired, and high myopia. In general the vision obtained by the telescopic spectacles was decidedly better than that with the ordinary test lenses.

Stock's article treats of patients (soldiers) who have normal peripheral fields with central scotomata, or defects of central vision with sector defects of the field. The patients fall into two groups: those with central vision less than 25%, and those above. For these cases the writer advises a prism telescope with an additional convex lens.

Erggelet has devised a foot rest for the telescopic loupe intended for the amblyopic. The stand carries a rod which can be raised or lowered according to the pleasure of the observer.

Rönne has made a study of the physical and practical properties of the different forms of lenses. He classifies them in the following order: Bispherical, plano-spherical, periscopic, menisci, punktal, Tscherning's lenses. The latter are anastigmatic like Zeiss's punktal lenses; they are also orthoscopic, which Zeiss's are not, and they give a larger visual field, but they are difficult to mount and their great curvature makes them unsightly. Strong bispherical lenses should be discarded on account of the limited visual field and the astigmatic effect of their edges; for example, an ordinary cataract glass has an astigmatism of 8 to 10 D. at its edges. It is desirable that oculists give not only the strength of the glass in their prescriptions, but also the desired form. Elsewhere Rönne has written a critique on the katral glasses, which he finds in some cases little, if any better, and under some conditions not so good as the less expensive forms. Their superiority is limited to particular uses of very strong lenses.

To lessen the excessive weight and thickness and the conspicuous rings or reflections of the edge in strong concave lenses of the ordinary form, **Schneider** devised in 1903 a method of grinding a concave lens which consists in forming a central concavity of the desired curvature in a main body portion of the required dimensions, which body portion is of a double convex, a plano-convex, or a compound convex form. Such a lens is light in weight, has thin edges and presents a neat appearance. By means of the toric grinding machine, it is possible to apply the same principle to produce the concave surface in oval form.

Weiss calls attention to certain inaccuracies in the denomination of the sizes of spectacle and eye glass lenses in the American system of numbering such lenses; the Germans having resolved to adopt this system, the writer thinks it worth while to note these departures from accuracy. They follow from the evident plan of numbering the sizes of the lenses in a uniform manner. He thinks that these departures from accuracy may be of practical importance in certain cases: the numbering being based upon the long diameter of elliptical lenses and the inaccuracies amounting to more than 0.1 mm. in this dimension, will be multiplied threefold for the circumference, they may accordingly become as large as 1 mm. for that dimension, and hence be of sufficient importance to be taken into account.

Henker comments upon the confusion prevailing in Germany resulting from the absence of system and uniformity in the sizes of lenses for spectacles and eye glasses. Representatives of those interested in the matter, oculists and manufacturing opticians, have taken up the question and agreed in recommending the adoption of the American system, the so-called standard forms. The standard sizes are given in a table taken from the catalogue published by a firm of American manufacturers of such lenses. While himself an advocate of the adoption of this system rather than attempt the creation of a new one wholly national, he points out certain defects in the American method which he hopes will be remedied in the practical application to the German trade.

Greeff has written on the constitution of such commission representing ophthalmologists and various optical firms and societies which has been named to deal with this subject. **Henker** later reports the resolution adopted by the committee of German oculists and manufacturing opticans for the standardization of lenses and frames. The committee have practically adopted the American standard for sizes with certain modifications thought to be improvements and better adapted for the needs of Germany.

Von Rohr, Kloth and Henker give a brief review of the models of various parts of spectacles and eye glasses submitted to the German Patent Office during 1914, 1915 and 1916. The inventions are not exclusively German, but represent other nations also.

On the ground that objects become more distinctly visible through a light filter having a color complementary to that of the back ground **Löwenstein** has suggested a color complementary to that of the blue sky for use by aviators. By spectroscopic observation of the sky such a color has been determined. How great the advantage of such glasses can only be ascertained by practical tests.

Zade's experience convinces him that most aeronauts are averse to the wearing of colored protecting glasses, since no glass is able to compensate the great changes in the intensity of light. He has suggested spectacles the lower part of which enclose colorless glass which gradually goes over to yellow and from thence to dark gray. By slight movements of the head up and down the wearer is able to select the suitable part of his glasses. Henker's yellow glass is strongly absorptive for blue.

Weiss, in a controversy with Boegehold, denies the accuracy of the latter's determination of the astigmatic faults of toric lenses. The discussion is almost entirely mathematical; those interested should refer to the original papers.

Von Rohr gives a resumé of the optical work from 1913 to the end of 1916.

He also gives an historical sketch of the development of shooting glasses for aiming—a subject of special interest during the war.

General Papers.—Olsho makes the point that the oculist's duty does not end with the writing of the prescription; he must also see that the lenses are properly ground, axes correct and that the supporting frames or mountings hold them securely and permanently, that the proper material is used, and that the lenses are so set that they will not easily or soon loosen.

Arens advocates a new form of trial frames which he has used successfully for a number of years. It consists of a horizontal spring metal band with clamps to fasten it on either side of the head. To this the trial frames are attached. The advantages of this device are that women's hair is not disarranged or caught as in the ordinary trial frame. It can be adjusted without removing.

Williams advises glasses for large refractive errors in young children and conservative treatment of asthenopia (soothing collyria, etc.) without glasses at least until general treatment has been tried, in many cases.

Fisher considers ophthalmic migrain to be caused by irritation of the visual nerve fibers at the base of the brain with implication of the chiasm. He suggests that slight swelling of the pituitary body may be the exciting agent. Being himself a sufferer with two added symptoms—reduction in pulse rate and polyuria but no disturbance of vision—he thinks that the explanation offered will account for the effect upon the pulse and kidneys.

Writing on the early treatment of mental disorders **Eager** has found the correction of refractive errors of decided value in nearly two percent of 4,695 cases seen in the mental division of the Lord Derby War Hospital. In his paper upon ocular headache **Charles** has summarized the leading facts regarding it. Writing on asthenopia, amblyopia and supraorbital neuralgia, **Peters** puts aside eye strain and errors of refraction, and devotes his attention chiefly to trauma and hysteria.

Mügge has written a paper upon anomalies of refraction and their general bearing on the faculty of vision. **Isakowitz** has discussed the influence of refraction upon the work of the painter. **Andrews** has written on the psychology of refraction, and **Cheatham** on the psychology of asthenopia.

Roy examined about 5,000 negroes belonging to 22 different colonies from an anatomic, physiologic and pathologic standpoint. He found that in the same individual the vision was better in the tropics than in the temperate zones; so that normal vision in the tropics should be regarded as 7/5 rather than 5/5 or even 6/5. When either convex or concave glasses were required V. often equalled 9/5 to 11/5. The best vision obtained in an emmetrope was 20/5 in a patient with sleeping sickness. The average visual acuity of negro emmetropes is 12/5. The refraction is almost always emmetropic except where pathologic changes have altered the corneal curvature.

Myopia is found in 1.5% and always of very low degree; never more than 4 D., and then in albinos, who are very common. There was about the same percentage of myopic astigmatism, while hyperopia and hyperopic astigmatism were found each in about 2.5%, but never of high degree. Compound astigmatism was occasionally found, especially in albinos, but never mixed or irregular astigmatism, except as the result of keratitis. Refractive errors are somewhat more common where schools have been long established. Of 50 observations of negroes of various tribes between 13 and 30 years of age, the accommodation was from 1 to 3 D. greater than at the corresponding age in whites.

Pflügk and **Rohr** write upon the Evolution of the Knowledge of Lenses, based principally upon the work of the Italian Sirturus, 1618, and the Spanish licentiate B. Daca de Valdes, 1623, Seville. The writers tabulate the numbering of the lenses by the former, and their strength in diopters. Reference is also made to other writers of the period in connection with this subject.

Ocular Movements

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This section reviews the literature of 1919 referring to ocular movements and their disorders.

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DIGEST OF THE LITERATURE.

Anatomy.—Magath, after commenting on the fact that the arrangement and distribution of the ocular muscles and nerves in man and animals is remarkably uniform and constant and reviewing a few anomalies that have been described, cites how he found in a male negro the right superior rectus supplied by two branches, about of equal size, derived respectively from the third and sixth nerves. **Brouwer** has reported a study of the anatomy of the oculomotor nucleus. **Cords** has written on congenital aplasia of the external eye muscles.

Congenital Anomalies. — Zentmayer describes a case of retraction movements in adduction, affecting the left eye of a boy of 6. As usual, abduction in the affected eye was less than normal; in adduction the left eye shot up and in, and the palpebral fissure narrowed.

Fixation.—Verwey, quoting Dodge, shows how it can be proved subjectively that accurate fixation of a point is prevented by small vibratory movements of the head and eyes (''pseudo-nystagmus of fixation''). In order to examine these movements objectively and separate those due to the head from those due to the eyes, Verwey examines with the Javal ophthalmometer a cornea previously sprinkled with calomel. As the fine particles of the calomel and the images of the steps reflected by the cornea are in different planes, the motions of the cornea make the particles appear to slide back and forth over the steps. The relation between the observed amount of this parallactic displacement and the angle through which the cornea vibrates has been calculated by this author, who finds that in normal fixation there is a nystagmus having an amplitude ranging from 9′ to 36′.

The same method is useful for examining the movements of the visual line when following a point in motion, or traveling along a broken or unbroken line. As stated by Dodge, the reflex for following a moving object emanates from the periphery, not from the macula. In the discussion, Weve pointed out that these slight nystagmoid movements due to fixation might also be studied with the ophthalmoscope (direct method). **Fernandez Castro,** according to an abstract of his article, states that if the tips of two fingers are held 30 or 40 cm. from the face and then separated a little, there appears between the two a mirage of the tips partly bridging the space, and ''remarkable in that the tips point in the opposite direction from the nearest tips''. This depends on fixation of the eyes beyond the distance of the fingers.

Marx has written upon fixation under varying conditions, and with **Trendelenberg** upon the precision of the fixation of the eye. **Sheard** and **Ferree** have written on the center of ocular rotation and the ocular movements.

Eye Positions Due to Tonic Reflexes.—DeKleijn has attempted to discover the nature and action of the tonic reflexes that emanate from the neck muscles and produce different positions of the eyes. His experiments were conducted on rabbits, which make no spontaneous movements of the eyes. He states that in these animals for each position of the head in space there corresponds a determinate position of the eyes, and that in general if the head is carried from one primary position to another the eye sets up movements as if trying to preserve the same orientation in space. As is known, the labyrinth exerts a marked action in inducing reflex movements. To eliminate this effect he examined rabbits in which the labyrinth had been extirpated.

In these he found that: (a) When the head is fixed and the trunk is turned about the dorso-ventral axis, the eye on the side from which the trunk is turned goes toward the nose, the other toward the ear. (b) If the trunk is rotated about the frontal axis, torsion movements take place—intorsion if the trunk is bent towards the occiput, extorsion if it is bent the other way. (c) If the trunk is rotated about the longitudinal axis, the eye toward which the animal's back is directed moves down, the other up. The same movements occur if the head is displaced with reference to the trunk instead of the trunk with reference to the head.

The former movements are frequent in the natural life of the rabbit, and in this case also the eye movements are such as to represent an attempt to conserve the position of the eyes in space. The reflex path for the reflex neck movements is probably through the first and second cervical nerves.

Benjamins made similar experiments with like results on fish (perch and carp) in which the static labyrinth had been destroyed. Rotation of the trunk about a frontal (transverse) axis caused mainly torsion movements (rotation about visual axis), with slight vertical movements (rotation about sagittal axis of eye). Rotation of the trunk about a longitudinal axis placed horizontally caused marked vertical movements of the eyes with slight torsion and not very marked side-to-side movements (rotation about vertical axis).

From his report of seven cases of strabismus with charts of fields taken on a special form of campimeter and from other facts regarding squint that it has heretofore been difficult to explain, **Ohm** argues in support of the importance of innervation from the labyrinth as a cause of squint, and believes that careful studies in this direction will throw valuable light upon the pathology of strabismus.

De Kleijn and **Tumbelaka** have described the vestibular ocular reflex in total unilateral oculomotor paralysis.

Orientation.—In a masterly paper **Sherrington** considers the effect of the proprioceptive nerves of the eye and also of certain extraocular factors on orientation. The paper should be read in its entirety by everyone interested in the physiology of the eye. He shows how experiments, such as are made in demonstrating Listing's law, prove incontestably that our conceptions of the direction of an object (whether straight in front of us or in an outlying situation) and of its position (whether vertical or tilted) cannot be afforded solely by retinal images, but must be given in part by alterations of muscular sense due to changes in the position of the eye.

The retina does, it is true, give us our notions of relative localization, i. e., of the relations of different objects and parts of objects to each other. In other words, it gives our ideas of the shape and size of objects. But the notions of absolute localization, i. e., of the relation of external objects to ourselves and of their absolute position, are afforded by the muscular sensations set up by the proprioceptive nerves of the eye muscles, combined with the sense impressions emanating from the optic labyrinth. With these, according to the experiments of de Kleijn, elsewhere cited, must be combined, in a minor way to be sure, impressions emanating from the muscles of the neck.

We may say that spatial perceptions are not purely visual but visuo-musculo-labyrinthin. There follows one corollary to this, of clinical importance. If the spatial perceptions afforded by the visual act are dependent upon three different sorts of afferent nerves, the co-ordination of the muscles employed in that act will also involve all three. Hence, an impairment of the muscular sense will impair both the spatial perceptions and also the co-ordination of the eye movements and eye postures accompanying these perceptions. In tabes the proprioceptive afferents are attacked early, and the muscular sense in the eye muscles may be thus impaired. It seems then significant that squints, often transient, are not infrequent as an early sign of tabes.

Stereoscopic Vision. — Various authors have considered from different viewpoints the factors that enter into stereoscopic vision. **Dudley**, from experiments made on aviators with the hand stereoscope, concludes that accommodation is not a factor, since patients show like judgments with a cycloplegic and without. That, so long as the vision is adequate, variations in visual acuity are of little significance, and that the 3:1 relation of convergence to divergence required does not seem to be essential. He agrees with Franklin that the sense of depth is not essentially ocular, tactile nor muscular in its nature, but is a psychic complex derived from all three of these sources and from other mental reactions and bodily experiences as well.

To those who have followed the careful experiments of Howard, cited below, **Eaton** in his two elaborate papers on stereoscopic vision will not appear to have assigned sufficient importance to the binocular parallax (which he denominates the "fusion sense"), nor will they agree with him that "prisms with defects which reduce the efficiency of the fusion sense, or throw it out altogether, lose in degree only, and may by training compensate in great part for the deficiency". He seems on more solid ground when in his second paper he shows the difficulties that beset the theory of corresponding points and argues for the projection theory as better explaining the nature of stereoscopic vision. He distinguishes between the optic or physiologic axes of vision, i. e., the visual line of each eye separately, and the "perceptive axis" of vision. In binocular vision, the perceptive axis occupies the mid line, connecting the middle of the intercentral base line with the object of fixation. In uniocular vision, the perceptive axis, in casual seeing may also occupy the mid line, and in that case we get false projection, but in accurate sighting, as in shooting, it occupies the visual line and then we get true projection. This second paper contains many interesting ideas and presentations, but is long and disconnected and cannot be well reproduced in abstract. Those concerned in the subject should read the original article.

Howard, in two articles, discusses in a very clear way the factors entering into the judgment of depth, taking up the problem with special reference to aviation. He shows that the size of the retinal image (visual acuity), the accommodation, the motion parallax, terrestrial association (under which he includes linear perspective, overlapping of contours, and light reflections and shadows), and, finally, aerial perspective are all of importance. These factors are common to binocular and uniocular vision. Those that are dependent on binocular vision are convergence and binocular parallax, which Howard separates, but which, to the reviewer, seem essentially identical. With an ingenious apparatus based on that devised by Burksbank he tested the binocular parallax at distances of six meters, and, as described in his second paper, he tested it with semaphores at 100 meters. Essentially, the same conclusions were reached, namely, that the binocular parallax is twelve to twenty times as sensitive as the visual acuity in determining differences of depth. (At six meters the binocular parallactic angle threshold is 1.80″ as against 1′ for the visual angle threshold. At 100 meters the average minimum binocular parallactic angle is about 5″.) Furthermore, uniocular vision is not only very much less able to judge depth differences, but its judgments are very slow and subjected to "reversal" deceptions (mistaking elevation for depression). On the other hand, if it were not for the limitations imposed by visual acuity, binocular parallax would enable us to appreciate depth difference at several thousand meters. In any event, its range is very much greater than the limit of 120 yards set by **Eaton**. To the convincing character of Howard's tests the reviewer can testify by personal observation. As Howard himself says, however, there are many factors which enter practically into this matter, and none must be disregarded in practical examination.

In a discussion before the Ophthamological Society of the United Kingdom, **Spearman** pointed out inter alia that eyes might take up the position for clear seeing if given plenty of time, but it did not necessarily follow that they would do so when speed was required. In aviation work, therefore, a test embracing the following of a moving field was necessary. **Brailey**, who had examined a great many cases, regarded the parallactic movement of objects as an all-important factor. In landing he did not think that stereoscopic vision could be of great assistance, because in going at high speed it would be difficult to make out the details of an object. As he rightly said, in making these complex judgments precision and rapidity of coordination between eye and brain were more important than medical perfection. Clements, in discussion, emphasized the importance of good peripheral perception, saying that the good flier looked at his horizon and used the nose of his machine as a protractor for measuring the flying angle.

Diagnosis. — Duane, in considering the routine that should be adopted in examining cases of motor anomalies, points out that such a routine must be based first, on a consideration of the normal movements of the eyes singly and in conjunction; second, the different possible perversions of these movements, and the evidence that each perversion affords of its presence; third, the most ready means of bringing these evidences to light. He restates at some length the known facts regarding the first point, gives the classification of anomalies that results from this consideration, and concludes with a description of his own routine in detail.

Theobald rightly emphasizes that in making routine examinations it is important to determine the deviation for near, as well as for distance. He believes that accommodative insufficiency cannot be detected unless the latter tests are made, and thinks that such insufficiency is indicated by a tendency to esophoria for near. This statement seems, to the reviewer, negatived by considerable clinical evidence. Theobald places no reliance on the tests for prism divergence and convergence in this again, running counter to the experience of many.

Onfray, in the course of an article devoted to treatment as well, shows that the examination of a case of squint must have regard to the conditions that govern binocular vision, and perversion of which therefore cause squint. It must, in other words, concern the patient's vision and refraction, his oculomotor state and his cerebral co-ordination (fusion sense). Hence his routine is, at the first visit, to determine the visual acuity and the angle of squint, instil atropin for a week, then determine the refraction and again measure the squint and order glasses. He follows this up with occlusion of fixing eye, and makes renewed tests of the acuity and squinting angle. Essentially, the same plan was followed by **Maxwell** (see under strabismus).

Holzer presents a useful modification of the Priestley Smith test consisting in the employment of an additional tape which keeps the moving test-object (examiner's finger) at a constant distance from the fixing eye. The reviewer may point out that the test would be more accurate if the tapes were made 57 instead of 60 cm. as stated in the article.

To test the motility of the eyes **Hess** proposes as a simple procedure the use of a tangent screen suspended so that its center shall be on a level with the patient's eyes. On this screen a series of lines, each space made to represent every five degrees removal from the fixation point, the patient being placed at a distance of 60 cm. The lines are marked in dull red, which appears bright through red glass and invisible against the dark background through green glass. Colored glasses are then placed before each eye, red before one, green before the other, supported on a head band. A black rod 50 cm. in length is used as a pointer, the end moving over the screen has attached to it a thread which passes through the center of the screen and is kept taut by a weight. This thread carries a green arrowhead, which is drawn by the rod to different parts of the screen and is seen by the eye covered by green glass while the lines are seen by the other. The false projection of the object upon the screen reveals the disturbance of movement. The colored glasses are arranged so that they can be reversed before the eyes, and two sets of diagrams are supplied, one for recording results with the red glass before the right eye, the other with a red glass before the left. The head is kept in position by a rod extending to the top of the screen and by the hand of an assistant.

Brailey's new heterophoria test, which he has applied with satisfactory results, consists of illuminated green letters in two rows, viewed through a green glass by one eye and a red spot viewed through a red glass by the other eye. The amount and kind of deviation are shown by the relation of the red spot to the letters. A rotating prism is used to show what correction will restore normal muscle balance.

Dolman repeats the various criticisms that have been made of the Maddox rod test and finds that complete accuracy can be secured by determining the relation of streak and light immediately on uncovering an eye, prisms being applied until, on such uncovering, the streak and light are coincident. The reviewer may say that he has for a long time found this method useful in determining the precise deviation, not only with the Maddox rod, but in other diplopia tests, e. g., with the red glass. Dolman rightly emphasizes the importance of applying the correcting prism, not over the fixing eye, but over the eye with the Maddox rod.

Le Pendu makes a table of diagnosis of paralysis, based on the inclination of the head in different directions of the gaze. This table he bases on the theory that the inclination is made to produce compensation for the rotation of the vertical meridian in the paralyzed eye. But that the head tilting is not due to this rotation, but to the attempt to compensate for a vertical diplopia, is shown by clinical experience, which, moreover, does not substantiate the findings given in the author's table.

Bissell's stereoscope, while primarily designed for measuring the blind spot, affords an excellent test of stereoscopic vision. It covers an angle of 25-30 degrees from the fixation point, and contains special meniscus lenses so as to correct aberration of oblique pencils. It has a horizontal slit to cut off view of all but the stereoscopic test cards. The central stereoscopic portion of the test card has two circles, one with a dot in it and a dot over it, the other with a dot underneath, so that the seeing of one circle with three dots is a conclusive proof of binocular single vision.

The special stereoscopic cards used in testing stereoscopic vision in the American Air Service are described and pictured by **Würdemann.** They originated in Germany, but were adapted by Würdemann for use by our army. They were the cards used by Dudley (in the article already cited). It was soon found that such tests with a hand stereoscope gave insufficient evidence as to the real ability of a man to appreciate differences of depth, hence **Cohen** has employed an apparatus for testing stereoscopic vision at a distance. It consists of four tubes containing white letters from Snellen's test card. These tubes are lighted from the rear and can be pushed forward or back through a measured distance. (See page 9.) Colored glass or isinglass plates can be placed over these. The test is made at thirty or forty feet and the patient made to tell which letter or color is nearest him.

Howard used tests applicable at 6 meters and 100 meters, respectively. For the former he applied the apparatus of Brooksbank James, which consists essentially of vertical rods, seen through a window by an observer placed at the proper distance, and with head fixed by a rest so as to avoid the parallax due to movement. The rods with a fixed lateral separation (corresponding to angle of one centrad) are set one in front of the other, the fore and aft interval being changed at will. A screen is removed from the window at the moment of observation and the observer required to tell which rod is in front. The 100-meter test is similarly made with semaphores on tripods, the latter being adjusted at varying distances. The observer, who is placed with his back to the semaphore, wheels round at the word of command and immediately states which semaphore disc is in front.

Argañaraz describes the various graphic methods of studying nystagmus. The photographic (cinematographic) methods are troublesome and expensive. Of this variety is the photonystagmograph of Wojatschek. Other instruments are based on the pneumatic method (Marey's drums applied to the eyeball). Of this kind Buys' is the most used, and this the author, in conjunction with Houssay, has modified to form his nystagmograph. By means of this, not only can the frequency of the movements be registered, but there is also disclosed the preliminary stage, or pre-nystagmus, consisting of an ocular tremor manifested during the rotary act. The instrument is not applicable for studying rotary nystagmus. He gives rules for studying the different kinds of nystagmus.

Three cases of simulated squint are reported by **Pichler.** One was of the alternating convergent type; the second resembled spasm of convergence, and the third was more hysterical abducens paralysis. He notes that the higher grades of strabismus cannot be simulated for more than a very short time.

Heine calls attention to the advantage of determining by lumbar puncture whether a condition of increased intra-cranial pressure is present in cases of paralysis of the eye muscles. If present it argues the existence of an intra-cranial process (tumors, hydrocephalus) causing the paralysis. Its absence, however, is not a proof that such an intra-cranial process does not exist.

Recording Deviations. — To record the deviations of the eyes when the patient closes them and the lids are raised by the observer's thumbs **Tracy** has developed a graphic method, using parallel and diverging vertical and oblique lines to indicate the directions in which the eyes turn.

Heterophoria.—In a suggestive, but, perhaps, over-enthusiastic paper, **Mills** insists on the effect of skeletal defects originating in the lower extremities or in the spine in causing head postures and also conditions in the cilio-spinal sympathetic center and the sympathetic pathways, both of which influence the proprioceptive functions of the extra-ocular muscles, retina and muscles of the neck, and put a strain on the labyrinthin mechanism. Owing to the racial prevalence of right-handedness, and the consequent excess in size of the left cerebral hemisphere and asymmetry of the head, the left eye is mainly affected.

He says that marked ocular imbalance is found more commonly among cases that are primarily orthopedic than among average eye cases. Hence we should endeavor to relieve, or rather prevent, heterophoria by orthopedic treatment, this comprising especially insistence on ambidexterity in the infantile and developing period and the early recognition and treatment of spinal defects. To many it will seem that the author, while his theories are undoubtedly stimulating and important, has to a large extent put the cart before the horse. In not a few cases, a marked deviation of the eyes can be discovered in children who have not reached the age when postural defects are in evidence; and per contra, not a few postural defects may be relieved by occlusion of the eyes or other purely ocular treatment.

Hill has found a considerable number of cases of typical convergence insufficiency among returned soldiers, who had been referred to him because of inability to do near work for any length of time and who had had no such trouble before entering the service. He queries whether such men are not entitled to temporary compensation until treatment has rendered them again able to take up their former work.

Impaired general health, uncorrected ametropia and heterophoria are given as the causes of eye-strain among aviators by **Campbell.** In his experience a certain number of "bad landings" and other casualties are to be attributed to heterophoria. Unless the prismatic correction can be worn constantly with comfort, officers presenting this defect should be regarded as ineligible for flying. **Broome** has also written on heterophoria in connection with naval service.

Suffa has written upon convergence and convergence insufficiency, and

Von der Heydt on muscular imbalance.

Treatment of Strabismus.—Various papers bring out points in the nonoperative treatment of squint, mostly, however, covering familiar ground. **James** points out three fallacies prevalent among the laity, and even among some physicians. These are, first, the belief that nothing can be done about the cure of squint until the child has reached school age or can wear glasses; second, that the operation for squint is one that can be done in a few minutes and the patient can be allowed to go home; third, that glasses can cure all cases of strabismus.

Dernehl, amongst other things, pictures a quite clever device for the comfortable and secure attachment of glasses in very young squinting children. **Lindgren** reports the case of a boy six and a half years old, whose vision in the squinting eye gradually rose from 5/50 to 5/9 by occlusion of the fixing eye. **Sauvineau**, by using contrasting images (red glass before the squinting eye, green glass before the other), aims first to secure recognition of binocular double vision, and by the same means to excite the fusion effort so as ultimately to produce binocular single vision. In squint with angle of 30°-40° he has been able in this way to obtain fusion and cure the squint in three months. With wider angles of squint he approximates the images by means of prisms while applying the red and green glasses. Later on, as the squinting angle decreases, the prisms also are diminished. He believes he can thus obtain a cure in all cases, provided there is no amblyopia. These methods, we may say, have been practiced with some satisfaction in this country.

The systematic treatment of squint by atropin instilled in both eyes to determine the refraction and diminish the angle of squint, by correction of the refraction to practically the full limit, by atropinization and occlusion of the fixing eye, and by orthoptic training is emphasized by **Onfray** and **Maxwell.** The latter's analysis of 1,300 cases of squint contains a great many interesting and important facts, and should be studied carefully by all concerned with the subject. Some of the outstanding points may be mentioned. First, the fact that cases in which fixation was faulty developed, as a rule, much earlier in life, which seemed to confirm Priestley Smith's idea that infants' eyes were amblyopic, and that the early development of squint hinders in the squinting eye the change from amblyopia to clear vision. Second, the fact that in the younger subjects the deviations for near exceeded that for distance. Third, that divergent squint, when associated with hyperopia, tended to assume the characters of a divergence excess, and, when associated with myopia, the characters of a convergence insufficiency. Fourth, the effect produced by the prolonged wearing of glasses is nearly twice as great as the immediate effect. The amount of this effect is greater naturally in the younger subjects, as is also the effect produced by the instillation of atropin. Fifth, prolonged instillation of atropin reduces the deviation considerably more than does one of a few days. Sixth, 40 per cent of the cases having binocular vision after treatment (with glasses) were able to discard their glasses at an early age. Seventh, in 50 per cent of the cases either a perfect or a cosmetic result was obtained by glasses. Eighth, in nearly two-thirds of the cases of exotropia in which diplopia was noted after operation the diplopia was hommonymus. Ninth, in operative treatment he used either tenotomy with an emergency suture, shortening (tucking) of the muscle, or a combination of the two procedures.

Interesting statistics are given as the varying immediate and remote effects of these operations. It must be noted that both in divergent and convergent squints the effects of two simultaneous operations (viz., a double tenotomy, a double shortening, or a shortening plus a tenotomy) was greater than the effect of the same operations consecutively performed. From a study of these statistics the younger Maxwell urges the advantages of early operation (after, of course, treatment by

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glasses and occlusion of the fixing eye), the use of post-operative rather than pre-operative fusion training, and the employment of tucking rather than advancement, except in certain cases where a large effect is desired (for tucking does not equal an advancement in its effect) or when the muscle is frail.

Cantonnet has written on the reeducation of vision and the treatment of strabismus.

Tenotomy and Advancement.—A reference to **Maxwell's** interesting statistics on the immediate and ultimate results of squint operations of various kinds (single and double tenotomies, single or double shortenings with or without attendant tenotomies) has already been given.

Kearney, in convergent squint if outward rotation is normal and deviation is 15°, does tenotomy of the squinting eye; if the deviation is as much as 30° he follows the tenotomy by a Landolt advancement of the external rectus, and if the deviation is 45° he does tenotomy of both internal recti. If the outward rotation is subnormal and the internal rotation is excessive, he does advancement of the external rectus followed, in case the deviation is 30° or more, by advancement of the internal rectus; and if the deviation is 45° he does a subsequent advancement of the external rectus of the other eye. In deviations under 15° he does a partial tenotomy of the internal rectus. In alternating squint he advances both external recti, and if there is any residual deviation adds a tenotomy of both interni. In divergent squint he advances the internal rectus. He finds that a complete tenotomy of the internal rectus relieves 15° of strabismus and the same amount of correction is effected by an advancement of the external rectus. Maxwell found rather greater average effects from tenotomy.

Valk's paper contains the suggestion that operation may properly be considered in every case of strabismus, and that apparent cure by other means may only be a conversion of a heterotropia into a heterophoria. It is pointed out by **M. Landolt** that operative should supplement nonoperative treatment. **Cilleruelo** regards tenotomy, single or double as may be required, as the best and safest operation for children.

Snell reports a case of paralysis of the superior oblique in which, after temporary improvement produced by a tenotomy of the superior rectus, he did a tenotomy of the inferior oblique with excellent results.

The method of muscular advancement with a supporting stitch proposed by **Terrien** was mentioned last year. The complete description of it has since come to hand. A meridonal incision 12 or 15 mm. long begins 3 mm. from the corneal margin and runs back in the direction of the tendon to be resected. The tendon is isolated, raised upon a hook, and the sutures inserted. The first of these, which is black, is introduced across the tendon as recommended by de Lapersonne. The fine needles on each end of the suture are then dipped into the sclera and brought out near the limbus, as shown in Fig. 5. The second suture, which is white, is also threaded with a needle at each end and introduced into the sclera beneath the tendon as shown in the figure. The first suture is then tied advancing the tendon; the ends of the second suture are then passed through the conjunctiva from within outward (see Fig. 6). When these are tied the conjunctival wound is closed. The second suture helps to secure firm union of the tendon to the sclera. Both are removed about the seventh or eighth day. Terrien claims to get perfect motility up to 45° or 50° in the direction of the advanced muscle. **Cilleruelo** has modified this by passing the second suture through the advanced tendon.

In a case of convergent strabismus in which the eye also turns upward, **Marquez** operated by the Lagleyze method of advancement and secured the correction of 65° to 70° of deviation. **Huizinga** has described a method of suturing the muscle in advancement which prevents the suture from pulling out or cutting their way through the muscle. It is easily understood from the illustration (A. J. O., v. 2, p. 606).

Tendon Shortening.—The year has been as prolific as usual in operations for advancement and shortening. **Bishop** describes and figures a tendon-tucker which he has devised and which seems like a good instrument. He uses 00 twenty-day catgut. **Maxwell** also invented a tendon-tucker, which is figured in the younger Maxwell's article. This was capable of making a tuck up to 18 mm. which was secured by a double suture passed first through the posterior lip of the conjunctival wound, then through the muscle, and then through the anterior lip of the conjunctival wound, where it was tied over a bead. In the case of a convergent squint the effect was increased by two anchor sutures passed through the superior and inferior recti, respectively, and through the outer canthus and tied there over rubber tubing. The effect is about 1° for each mm. of shortening (about half the effect produced by an advancement). **Catlin** has had good success with Briggs' method and **Fernandez** with Reese's resection.

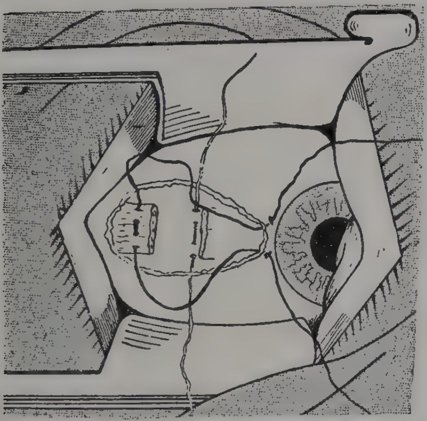

Fig. 5. Terrien's operation for muscular advancement, showing the sutures placed. 1 black in tendon and limbus, 2 white in sclera just back of original insertion in tendon.

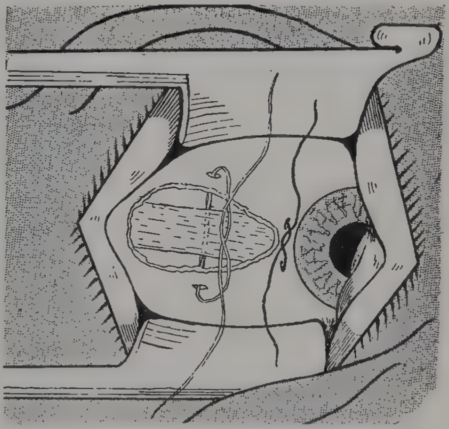

Fig. 6. Terrien's operation, muscle drawn forward by suture 1. Suture 2 ready to be tied around tendon, and close conjunctival wound.

Resection of Tendon.—In **Kleefeld's** operation a resection of the tendon is done one mm. behind its insertion, and the stumps are united by two double-armed longitudinally placed sutures. A third double-armed suture is carried through the stumps transversely and in such a way as to pass through the loop formed by each of the longitudinal sutures on one stump and between the double arms of each longitudinal suture on the other. When the sutures are tied, this third, or crown suture, should take up some of the strain on the longitudinal sutures and prevent their tearing out.

Castresana's operation is also a resection in which three sutures are passed underneath the muscle through the sclera and through the conjunctiva at each side of the wide cresentic gap formed in the conjunctiva. When the sutures are drawn taut the muscle is indirectly advanced. Each of the muscles is fastened to the skin with adhesive plaster. Stout adhesions are formed which render the result permanent. He respects one mm. of tendon for each 2.5° of effect. The operation of **Ruiz** seems to be nothing but Oliver's single-stitch operation, except that the stitch, after passing through the distal stump, is carried also through the distal lip of the conjunctival wound, which latter, therefore, is brought forward with the tendon and carried with it underneath the proximal lip of the conjunctival wound and as far forward as the cornea. As illustrating the accidents that sometimes attend advancement, **Gonzalez** describes a case of episcleritis with tenonitis caused by an advancement by Lagleyze's method, in which the sutures are passed through the sclera.

Transplantation.—Crossley exhibited a case in which Woodruff had performed the operation of transplantation for restoring power to a paralyzed external rectus. The operation was done by Hummelsheim's method, described by Woodruff two years before, the outer halves of the superior and inferior recti being detached and stitched to the insertion of the paralyzed muscle. In the case described, the operation was done on both external recti, with fair success in one eye and but little effect in the other. **O'Connor** in doing a similar operation for a like condition, splits the external rectus into three segments, of which the two outer are detached and the central one is shortened by his double-stitch method so as to take off the strain on the lateral tongues. The latter are attached by mattress stitches to the slips detached from the superior and inferior recti. In making the transplantation he takes care to include the capsule of Tenon in the slips detached from the superior and inferior recti. In one case he got a perfect result, cosmetic and functional; in another the result was not quite so successful.

Loss of Oculogyration.—In a case of external ophthalmoplegia reported by **Spiller** there was, with right oculomotor palsy, which partly recovered, a nearly complete paralysis of "dextrogyration" (wheel rotation to the right) of both eyeballs, and partial palsy of "sinistrogyration" (wheel motion to the left), and loss of function in the left internal rectus. Spiller makes the point that this loss of oculogyration indicates a lesion near the corporaquadrigemina involving the connecting fibers of the nucleus for the internal rectus of one eye with the nucleus of the opposite abducens. He believes that when the central pathway of cortical nuclear oculogyration is paralyzed above or in the nucleus of the nerve to the affected internal rectus, the function of this muscle in convergence will disappear or become much impaired, as in this case. When the break occurs above this nucleus no impulses can pass for either oculogyration or convergence. But when the break occurs below the nucleus the function of the internus for convergence may be preserved. This applies only when the lesion is near the nucleus.

Paralyses.—An editorial in the **New York Medical Record** gives a succinct statement of the principles governing diagnosis of ocular paralyses in cerebro-spinal meningitis. A characteristic sign is that the paralyses are usually transitory, and even if persistent become remarkably attenuated. They are often associated with paralysis of accommodation, which may either occur early in the disease and then usually disappear in a few days, or may occur late and then last several weeks. In rare cases the paralysis occurs as a sequel to the meningitis. In seat these paralyses are usually basal. If orbital they must be diagnosticated from those due to trauma or orbital growths (e. g., in the latter case, by absence of exophthalmus or edema of the lid or lack of venous stasis). A paralysis involving the nerve nuclei is characterized by a progressive bilateral affection of the exterior muscles without involvement of the pupil or accommodation. It may appear under the guise of an associated (conjugate) paralysis, e. g., nuclear paralysis of the sixth will be associated with a paralysis of the internal rectus of the other side [for lateral movements only—Reviewer]. Diagnosis must be made from otitic paralyses, which usually affect the external rectus and in which the presence of ear symptoms will usually indicate the cause. In tuberculous meningitis the diagnosis will be made certain by the result of lumbar puncture.

Abducens Paralysis.—The cases reported by **Mardellis** and **Crossley** (the latter a bilateral paralysis) were due to traumatism, while other cases were caused by botulism (**Jennings** et al.), influenza (**Zentmayer**), and acute otitis media (**Stickney**). In one of Stickney's two cases the paralysis seems to have been toxic, since at operation the tegmen tympani was found intact. In the discussion of Zentmayer's paper, **Shumway** described six cases of ocular palsy (abducens, or third nerve) due to a disease, probably an encephalitis, resembling, if not identical with, encephalitis lethargica (**Woods**); and **Ziegler** spoke of three cases of abducens paralysis, peripheral in origin, due simply to cold. **Uchermann** writes on abducens paralysis following operation for acute mastoiditis.

Of paralyses of the superior oblique **Snell** reports one due to traumatism (ultimately relieved by tenotomy of the inferior oblique), and gives a good résumé of similar cases that have been reported. **Percival** likewise reports a case, with mention of two others. In these either no treatment, or simply correction with a prism, was used. **Finlay** reports a case due to ethmoiditis, and thinks that these might be found more often if looked for. **Bourland** reports a case ascribed to diabetes. It is not clear, though, from his description that the paralysis actually involved the superior oblique.

Three cases of ophthalmoplegia reported by **Pulleine,** incomplete paralyses of the third nerve, are described as due to myasthenia gravis (**Taylor**). These cases, if the ascription is correct, seem peculiar in that the ocular paralyses were the only evidence of muscular weakness found. Incomplete third nerve paralyses are reported as follows: Due apparently to traumatism, but really to congenital lues (**Fernandez**); to juvenile tabes (**Lereboullet** and **Mouzon**), and to botulism (**Jenings** et al.); and a case of recurrent paralysis, evidently ophthalmoplegic migrain, is recorded by **Dabney. Uhthoff** writes on recurring oculomotor paralysis. **Agatston** describes a case of unilateral ophthalmoplegia interior occurring in a case of pneumococcus conjunctivitis and, since other causation could not be found, ascribed to pneumococcus infection. **Teal** describes the development in a woman of 48 of ophthalmoplegia exterior, total in the right eye and at first partial; later, total in the left. The condition later improved considerably. He regards it as necessarily nuclear in origin.

Total and complete bilateral ophthalmoplegia exterior occurred (probably as a mere coincidence) with exophthalmic goitre in a young woman seen by **Souques,** and a like condition ascribed to malaria, since it developed suddenly with a fever and chill and yielded readily to quinin, is reported by **Fournier.** Paralysis of convergence was noted in one of the cases of lethargic encephalitis described by **Woods,** and **Zentmayer** notes among his cases of palsy due to influenza a diplopia resembling that produced by paralysis of divergence. **Schoenberg** reports a paralysis of associated movements up and to the left, coupled with insufficiency of convergence and paralysis of accommodation. The condition, which was luetic in origin, he ascribes to a lesion in the right anterior corpus quadrigeminum and the nucleus medialis.

A case of bilateral abducens paralysis apparently due to influenza is reported by **Pichler.** The patient, a woman of 35, had suffered influenza a month before she was first seen, and in about a month later had completely recovered from the paralysis. **Pascheff** reports a case of paresis of the oculomotor nerve only which was due to intracranial traumatism, the wound in the back of the head. A case of recurring oculomotor paralysis with hemicontraction of the sphincters of the pupil is recorded by **Löwenstein.** Oculomotor paralysis occurring as the first symptom of abscess of the frontal lobe of the brain is reported by **Hönig. Kashiwai** reports an oculomotor paralysis in a young woman. **Löhlein** describes a case of ophthalmoplegia involving all the external ocular muscles on both sides apparently of psychogenic origin. In a report of miscellaneous cases, **Damel** includes six involving palsies of the ocular muscles, and gives a review of the anatomy of the nuclei with a discussion of clinical symptoms. **Bielschowsky** has written on bilateral paralysis of rotation. **Mazumoto** has described the degenerative changes in the eye muscles found in a woman dying from exophthalmic goitre.

Spasm of Eye Muscles.—A case of extreme conjugate deviation to the right, combined with marked astereognosis, is described by **Riley,** who goes carefully into the neurologic basis of conjugate paralysis and spasm and the localizing diagnosis afforded by the symptoms in such cases. He admits, however, the possibility of the existence of other tracts and centers which he does not describe, and the activity of which seems evidenced by the fact that in his case, although the eyes could not be brought beyond the mid line by voluntary effort, they could be rotated about normally to the left if the eyes were fixed on an object and the head rotated by the examiner to the right. The condition in the case in hand was regarded as a spasmodic deviation due to irritative supranuclear lesion, which he locates in the mesiad extremity of the mesial fillet.

Cases of evidently functional spasm of convergence due to war traumatism and mustard gas poisoning are described in a well-written article by **Lafon.** Probably the same condition explained the strabismus observed in one of the cases reported by **Moreau,** and in the case reported by **Hurst,** in which latter also left facial paresis, right facial spasm, ptosis, amblyopia and various other symptoms followed gassing, and were relieved by persuasion and re-education. It is noted by Lafon that in several cases of the sort, since the deviating eye was apparently unable to move outward, when the patient was directed to follow an object with both eyes open, the diagnosis was made of abducens paralysis. But when the fixing eye was covered, the deviating eye could move outward normally. In one case the convergence spasm was so extreme that the eye, although capable of making fairly wide movements, seemed almost immobile, thus simulating an ophthalmoplegia exterior.

Quite similar are the cases described by **Descomps** and his colleagues in which the condition occurred in patients who had been subjected to shell shock. The spasm was most readily induced by the rotation test, ten turns sufficing to put the eyes in a position of marked temporary convergence. Sometimes there is no other evidence of motor trouble in the eyes; in other cases, if the patient is directed to look to one side the outer moving eye halts in the mid line, while the other follows. This the author regards as an evidence of paresis of the external rectus, but from the observation above cited of Lafon it seems probable that we have to deal here only with a particularly marked convergence spasm. Descomps and his colleagues conclude that spasm of this sort may be regarded as an indirect sign of lesion of the auditory apparatus as well as of a lesion of the oculomotor centers or of the efferent branches from the motor centers of the eye. Convergence spasm may also be induced by encephalitis lethargica **(Woods).**

The peculiar spasmodic retraction of the eyelid associated with movements of the jaw (jaw-winking) is very fully described by **Lutz** with an account and bibliography of the subject and the various theories that have been advanced. He thinks it due to alterations in the supranuclear connections in the posterior longitudinal fasciculus, and probably "to a lesion of the inhibitive mechanism just anterior to the dendrites of the damaged nuclear cells of the nervus oculomotorius".

Spasm of convergence with intermittent nystagmus, as seen among soldiers, is the subject of a paper by **Elschnig.**

Nystagmus.—A method of measuring nystagmus has been described by **Majewski.**

In considering the question of induced nystagmus **Fisher** and **Babcock** conclude from a great number of records made in examinations for the air service that the duration of after-turning nystagmus is not impaired by flying—in other words, a man does not overcome the tendency to nystagmus by practice. They think, but on this point have not sufficient data to be positive, that the same obtains for acrobats, whirling dancers, etc. Furthermore, repeated turning experiments on normal persons produce no real shortening of rotation nystagmus. Hence, absence or impairment of eye response, following ear stimulation, definitely indicated a pathologic condition in the vestibular mechanism. **Levy** comes to the same conclusion. On the other hand, **Dunlap** severely, and apparently with some reason, criticizes Fisher and Babcock's statements and conclusions.

Argañaraz describes the nystagmus, accompanied by other ocular symptoms and by general disturbances, caused in rabbits by excitation and extirpation of the cerebrum, cerebellum and labyrinth **(de Kleijn)**. In a further paper he considers the morphology of nystagmus, of which, following the French and Belgian authors, he distinguishes three types, viz., (a) undulatory or pendulum-like form, seen especially in congenital cases; (b) form marked by rhythmic jerks (spring-like nystagmus), observed in laboratory nystagmus or nystagmus due to disease of the cerebrum or cerebellum; (c) mixed forms. In indicating the character of nystagmus it is best to follow **Bartels** and give in each case the number of vibrations and their velocity in a determinate time.

Dameno makes the following classification of nystagmus, which, as reproduced in the abstract, seems to be open to some criticism from a clinical standpoint: (1) congenital; (2) occurring in the first months of infancy and due to various causes; (3) miners'; (4) secondary (from eye operations or occasionally from refractive errors or reflex causes); (5) voluntary; (6) due to diseases of nervous system, e. g., from hysteria or traumatic neurosis, multiple sclerosis, familial diseases (Friedreich's disease, Marie's disease, etc.), apoplexy, encephalitis, hydrocephalus, sclerodermia, mastoiditis; (7) myoclonic; (8) from cerebral tumor; (9) of vestibular origin.

Of nystagmus in its clinical aspects, **Moreau** describes three cases (two horizontal, one vertical) produced by shell shock. There was no involvement of the labyrinth in any of these. Analogous, doubtless, was the nystagmus seen in some of the cases described by **Lafon** and by **Descomps** and others. Other conditions reported as giving rise to nystagmus are mustard gas poisoning **(Ratnaker)**, lethargic encephalitis **(Woods)**, and botulism **(Jennings** et al.).

Latent nystagmus, i. e., the variety which develops only when either eye is covered, is described and the theories which have been advanced to account for it are given by **Jacobs** and **van der Hoeve.** Naturally in these cases uniocular is much inferior to binocular vision. **Berg** has reported a case of latent nystagmus. **Zentmayer** reports a case of unilateral vertical nystagmus in a girl of fifteen. The tremor affected the left eye, which had formerly squinted, but which had become straight from correction with glasses two years before. There was also a left otitis media. In the right eye very slight movements were detected with the ophthalmoscope. **Baird** has reported a case of latent nystagmus. **Gowland's** patient, a man of 36, had from childhood been able to produce a voluntary nystagmus, evidently by great effort. The nystagmus was accompanied by oscillation of objects seen. The author considers at length nystagmus in general and the special subject of voluntary nystagmus in particular, with its varieties and causation.

Brückner has written on voluntary nystagmus, regarding it as the result of strong innervation of all the eye muscles. Six cases of latent nystagmus have been reported by **Wehrli.** One of his patients, however, was an excellent marksman. By a certain inclination of his head he was able to make his eyes steady. **Witmer** reports a case of nystagmus with spasm of accommodation, which he traces to a disturbance of the centers for accommodation and convergence. **Bard** explains nystagmus as a double reflex, part cerebral, part cerebellar. In pathologic nystagmus the reflex is exaggerated in one direction and suppressed in the other. The influence of binocular vision on nystagmus is the subject of a paper by **Ohm**, who also has written another paper upon miners' nystagmus and accidents. **Benoit** has written on the bulbar syndrome of coal miners. **Beck** reports central nystagmus after severe asphyxia.

The Conjunctiva

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This section reviews the literature relating to the conjunctiva and its diseases appearing during 1919. For previous references to the subject see A. J. O., March, 1919, p. 45.

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DIGEST OF THE LITERATURE.

Blood Channels in Conjunctiva.—**Kershner** has seen two instances of blood channels of the conjunctiva similar to the cases reported by Lang. One case occurred in a blond, the other in a brunette. With the blood channels were enlarged tortuous veins. Histologically the conjunctiva presented vessels with only endothelial walls. In places the channels showed the lumen as flattened septa-like slits with endothelial cells. Normal vessels were also present.

Sensitiveness of the Conjunctiva.—Experimental studies of the sensibility of the conjunctiva were made by **Sakai** with the following results: (1) The conjunctiva has the sense of touch as shown by Nagel, but less relatively than the edges of the lid, skin of face, etc. (2) The fissural conjunctiva of the ball has a little less sensitiveness than other parts. (3) The sensation of warmth is absent; this is true also of the caruncle and semilunar fold. (4) The bearable heat is 42°-43° C. (5) Pain is experienced in spots, especially in the conjunctiva of the lids. (6) The difference of the sensitive points is the least on the free border of the lids (8.7 mm.), while that of the conjunctiva is 15 mm. (7) Sensation to chemical substances is less than for cold.

Infection Through the Conjunctiva.—In an effort to solve the question as to whether influenzal infection could take place through the conjunctiva, **McCord** undertook some experiments with the B. prodigiosus. The organisms were introduced into the conjunctiva and an effort made to recover them from the throat and nasal cavities. In no instance was it successful.

Examination of Upper Culdesac.—In his paper **Terson** describes the usual methods employed. He has found all of them at times inadequate. His method is to inject beneath the skin of the lid cocain or holocain, the patient being recumbent. The lid is seized horizontally with forceps. He employs a forceps with clamp and with a broad fixation plate. With this he rolls the lid in its horizontal axis and exposes the entire culdesac. This method of examination aids in the diagnosis and treatment of foreign bodies, unrecognized vegetations, granulations and tumors of the culdesac. It demonstrates that sometimes the conjunctivitis called follicular (more correctly termed adenoid) exists also in the superior culdesac, although to a degree much less than in trachoma. It aids also occasionally in diaphanoscopy of the eye.

Statistics of Conjunctivitis. — The bacterial findings in 600 cases of conjunctivitis in an army base hospital were given by **Bowman.** Pneumococcus was present in 24, pus organisms in 18, staphylococcus albus in 16, xerosis bacillus in 10, K-W. in 6, M-A. in 4, miscellaneous in 4, streptococci nonhemolyticus 4, S. hemolyticus 1, bacillus of influenza 3, gonococcus 1, diphtheria bacillus 0.2 per cent.

In 21 cases of pseudomembranous conjunctivitis examined by **Gamal ed Dine** in 1918, the smears showed, in the majority of instances, the gonococcus. The streptococcus, staphylococcus, pneumococcus and K-W (Koch-Weeks) bacillus were the other organisms found in the order of their frequency.

In studying the tissues affected by various germs which are pathogenic to the conjunctiva, **Lindner** observed that the gonococcus attacked the epithelium and was found between the cells. It is only occasionally that they are found in the deeper tissues. The diplobacillus attacks the lid margins and dead epithelium. The diphtheria bacillus attacks the epithelium and deeper conjunctival tissues. The pneumococcus and streptococcus grow rapidly on the conjunctival epithelium and attack by preference the bulbar portion. The staphylococcus is a skin parasite, but attacks the epithelium of the conjunctiva. The xerosis bacillus is a saprophyte attacking only dead epithelium.

McWalter writes on his experience with 873 eye cases among mostly Turkish prisoners of war in the desert. The bulk of the cases were trachoma (of which 50 per cent were complicated ulcers, iritis, pannus, keratitis). Among the cases of conjunctivitis the K-W bacillus was the most virulent and most contagious. He estimates that certainly 90 percent, possibly 99 percent, are preventable. Among the Turks, as among most Orientals, trachoma and other eye affections are undoubtedly spread by their habit of covering their faces by blankets and towels when sleeping.

From a review of "Larrey's de Chirurgie Militaire et Campaigns" **Eason** says it is evident that the epidemic of ophthalmia among Napoleon's troops in Egypt in 1799-1801 was not trachoma, but an acute purulent ophthalmia, such as is seasonal every year in Egypt from July to December, and is caused by the gonococcus, Koch-Weeks bacillus, or the diplococcus of Morax-Axenfeld. Eason found among 3,000 eye cases occurring in the British Army in Egypt during the last half of 1916 and the years 1917 and 1918, 279 cases of trachoma, of which only 63 were recent, the rest having been acquired before the soldiers arrived in Egypt. "Ophthalmia" generally caused about 10 percent of the total eye cases. The conjunctivitis was seldom severe; only five eyes were lost from perforation, staphyloma or panophthalmitis. Eight cases of gonococcal conjunctivitis occurred since 1916. He concludes that the infectivity of trachoma among soldiers is almost negligible, and that ophthalmia of any sort is not a serious danger to an army with modern standards of sanitation.

To study the prevalence of various cocci in the normal conjunctiva, **Ito** and **Sakai** examined 49 cases. The streptococcus was found in 25 cases, the pneumococcus in 14, and in 10 cases both the streptococcus and the pneumococcus were present. They were able to eliminate the pneumococcus by washing the conjunctival sac with optochin (1:10,000).

Pichler encountered three distinct epidemics of conjunctivitis due to the Koch-Weeks bacillus. The epidemics occurred among the personnel of a veterinary corps. A total of 180 cases were seen. Each epidemic occurred after the arrival of a new contingent of Hungarian soldiers, and was presumably carried by them. The Koch-Weeks bacillus is especially virulent and quite prevalent in certain districts of Hungary. There also was a possibility of horses acting as carriers of the disease.

McCallan in 1917-18 reported certain observations on the relations between certain varieties of conjunctivitis and the average climatic temperature. The number of new patients seen is very much greater in summer than in winter. This may be due to the shorter days of winter giving less time for those who come from a distance to go and come from the hospital and in difficulties in traveling, but is principally due to the increased amount of communicable eye disease—that is, acute conjunctivitis — during the summer. Neither atmosphere, humidity or variations in the level of the Nile bear any relation to this increased incidence of conjunctivitis. Studies made since then confirm this opinion.

Kershner states that at Camp Sevier 749 cases of acute conjunctivitis were treated; 400 of these occurred epidemically coincidentally with an epidemic of mumps and measles. The pneumococcus was the exciting organism in a large percentage of the cases. Vernal and phlyctenular conjunctivitis were observed but rarely. Sixteen cases of trachoma were treated. Five cases of gonococcal conjunctivitis were seen. Pinguecula and pterygium were very common.

Barrett gives a partial list of eye cases seen in the first Australian hospital at Heliopolis, Egypt, during 1915 under the term "ophthalmia" 546 cases; chiefly K-W and a percentage of diplobacillary conjunctivitis were recorded.

MacCallan tabulates the cases of conjunctivitis seen in Egypt during 1918, first, as to the monthly percentage of certain organisms to the total microorganisms found; second, the seasonal variations of particular organisms as compared with all other organisms. The gonococcus is the main cause of the increase of acute cases and appears subsequent to a rise of temperature, although the upward trend of the gonococcus curve continues disproportionately long as compared with that of the temperature. The maximum was October, while the maximum temperature was July. The K-W conjunctivitis increases with the spring rise of temperature, but its maximum incidence is found in April and May. The M-A (Morax-Axenfeld) conjunctivitis does not vary so much during the year in its incidence. It is, however, somewhat more prevalent in the early part of the year, and as compared with other organisms much more frequent at this time. He finds that in Egypt acute conjunctivitis is a more important cause of blindness than trachoma.

Ophthalmia Neonatorum.—An editorial in the British Journal of Ophthalmology points out that in London and several larger towns, following the example of Manchester, special hospital accommodation is provided where both mother and child are received for treatment. For these hospitals to serve the purpose for which they are intended, namely, the prevention of blindness by corneal ulceration, which usually starts during the first few days of the disease, it is obvious that the cases must be admitted at the earliest possible moment. At St. Margaret's during the first few months the average date of admission was three weeks—too late to prevent corneal ulceration. The article urges that practitioners and resident medical officers should from time to time be reminded of the existence of special hospitals for treatment.

An editorial in the Kentucky Medical Journal reveals that during the past year a number of physicians were arrested and fined for failure to report to the health officers all inflammations of the eyes of the new born. It is pointed out that the necessary prophylactic means are supplied free to physicians who request them.

Allport has formulated fourteen points which he considers especially important in the prophylaxis of ophthalmia neonatorum.

Gonococcal Conjunctivitis of the Adult.—**Kofler,** arguing from the fact that in the presence of a pneumococcic ulcer with dacryocystitis a cure can only be effected by removing the source of the infection, has resorted to extirpation of the palpebral conjunctiva in gonococcal conjunctivitis of the adult to avoid or cure the corneal complication. Under local anesthesia and hemostasis the entire infiltrated palpebral conjunctiva is scraped away, the wound surface painted with iodin, the excess mopped up, and a lead-water dressing applied. He cites the records of five additional cases so treated. In these cases corneal ulcers had already developed. The resulting vision in each case is given to support the author's contention of the value of the procedure. He believes that cases in trachomatous eyes run a particularly unfavorable course.

Diamere, in his experience of 140 cases of gonococcal ophthalmia, has noted that the lesions are most severe where there is a pure culture of gonococci. When associated with micrococcus, and especially the K-W bacillus, the course was exceptionally mild. This suggests the employment of a virus of K-W infection to attenuate the gravity of the gonococcal ophthalmia.

Hühn believes that the 27 cases of adult gonorrheal ophthalmia which came under his observation during the war were favorably influenced by the subcutaneous injection of sterilized milk.

Nussbaum injected 10 ccm. of sterilized milk into the buttocks of a patient who had deterioration and softening of the cornea complicating a gonorrheal conjunctivitis. Two days later the secretion stopped and the swelling diminished. In ten days the cornea was completely covered with epithelium.

Giri commends the use of "protosil," an organic compound of silver, in the treatment of ophthalmia neonatorum. He employs a 20 percent aqueous solution instilled into the conjunctival sac every two hours for the first few days. He deprecates giving ointments for home use with directions to use a glass rod or a camel hair brush, for fear of corneal abrasions resulting.

In the treatment of a case of purulent ophthalmia in a baby two weeks old (in which the discharge was severe), **Thompson** used a common desk lamp with a flexible shaft and an old style 16-candle power lamp. The lamp was brought to within 12 inches of the face. The light was one hour on and one hour off. In three days' time the eyes completely convalesced.

Kraft and **Doesschate** successfully treated three cases of gonococcal ophthalmia in the adult by the use of diathermia applied by the large instrument of Koch and Storzel. The current is an alternating one of 150 volts, with 50 alternations to the minute. The instrument is regulated in the primary and secondary diathermic current. The electrode applied to the eye is made of solid metal to conform to the front of the eyeball. Between the lids and the electrode is placed a thin layer of cotton wet with salt solution. The other electrode, made of lead, is tied around the patient's neck. The beneficial results are probably due to the heat development, as nothing is seen of an electric reaction.

In a case of gonococcal conjunctivitis in a girl of 9 years **Sommer** gave intravenous injections of arthigon. The first dose of 0.05 was not followed by improvement. On the third day a dose of 0.1 was injected and was followed by marked betterment in all symptoms. On the fifth day of treatment the purulent secretion had almost ceased. Local treatment consisted in cleansing with permanganate solution and the instillation of protargol.

Livingstone, convinced of the uselessness of silver nitrate in combating gonorrheal ophthalmia in the adult, has, in his last three cases, used colloidal manganese and all have made excellent progress. In a man 24 years of age with the condition of two days' duration presenting marked edema of the lids and conjunctiva, which was treated locally with boric lotion every hour by day and two by night, and with argyrol in 10 percent solution every six hours, an injection of 1 cc. of colloidal manganese was given intramuscularly. Two days later it was repeated, resulting in marked improvement. Four days later a third injection was given. Nine days later the conjunctiva was almost normal and the discharge had almost ceased.

Darier has had very good results with the antigonococcal vaccine of Nicolle and Blaizot in the treatment of purulent conjunctivitis of the adult. Although local treatment was also employed, he is inclined to give the vaccine full credit. **Sauvineau** records a case in which the Nicolle-Blaizot serum acted most favorably where the gonococcal conjunctivitis was associated with synovitis. **Mason** cites a case of infection of a nurse's eye by gonococci from an infant, in which the progress of the case was aborted by the instillation of 2 percent nitrate of silver, followed by 20 percent solution of silvol every two hours. **Bruns** finds argyrol valuable when used in proper strengths, intervals and duration. He claims that a strength of 2 or 2½ percent possesses all the valuable properties of the drug and reduces to a minimum all unpleasant or harmful effects. The intervals should be short; in the severest affections, every fifteen minutes, and in the mildest, at least every two or three hours. Probably two weeks is the utmost length of time that it can be used with benefit. The conditions for which he uses argyrol with expectation of benefit are: Cleansing the conjunctival sac especially before all operations; cases of beginning epiphora without obvious cause, and for almost all cases of epiphora for the purpose of testing the openness of the lacrimal passages; simple corneal ulcers, erosions, excoriations, especially the marginal ulcers of the old; mild cases of conjunctivitis, alternating with borax wash. He finds that it is an efficient remedy in ophthalmia neonatorum if instilled every fifteen, thirty or sixty minutes in 10 to 15 percent strengths.

Meissner reports a case of adult blenorrhea in a man who was free from gonorrhea. **Waldmann** found that bandaging the eyes of patients affected with ophthalmic blennorrhea protected the cornea from injury.

Hesse observed that animal charcoal, made from blood, had a favorable effect on various inflammatory conditions of the eye. He tried it on cases of ophthalmo-gono-blennorrhea. Twenty cases were treated and the clinical and microscopical results noted. He observed improvement in some cases, but the general results were not so favorable as he had anticipated. He concludes that animal charcoal hardly deserves a very prominent position in the list of therapeutic agents useful in the treatment of blennorrhea.

Kirkpatrick found the injection of gonococci vaccine of value in addition to the local treatment of gonorrheal ophthalmia. **Haab** did not get such brilliant results as Szily and Sternberg after injecting typhoid vaccine in gonorrheal ophthalmia, but believes the therapy worthy of more extended trial and further development. **Reitsch** states that the good effect of the subcutaneous injections of typhoid vaccine in adult gonorrheal blennorrhea cannot be questioned. If the vaccine cannot be obtained he believes that sterilized milk is just as effective. He reports three cases in which benefit was derived from the injection of the vaccine.

Metastatic Gonococcal Conjunctivitis.—In **Carreras'** case the conjunctiva and cornea, as well as the iris and ciliary body, were involved. One knee developed arthritis. Recovery of the ocular lesion took place in thirteen days, but the joint lesion persisted longer. Vaccine therapy was employed. According to the author, the cornea is rarely affected, but iridocyclitis is a frequent complication of metastatic gonococcal conjunctivitis.

Purulent Ophthalmia. — **Buckeridge** records a personal experience. The condition came on with slight irritation. In an hour's time there was a purulent secretion. Irrigation with a solution of bichloride (1-5000) was followed in a few hours by redness and edema of the eyelids. Five hours later the fellow eye was infected. In twelve hours the condition was greatly aggravated. In twenty-four hours from the beginning the eyes were practically normal. He considers that the differential diagnosis between this disease and gonococcal conjunctivitis rests upon its sudden onset, almost simultaneous infection of the two eyes, quick advent of purulent exudate and almost complete absence of pain.

McIlroy states that after an artificial eye had been supplied to a soldier, in some instances a purulent discharge occurred. The prevailing organism from nine cases was the staphylococcus aureus. Methylene-blue proved to be very active clinically, but had very little bactericidal action upon the organism obtained from the discharge.

Obscure Ocular Infections in Infants.—**Wallace** records a case of severe ocular infection in a baby continuing from the second to the sixth month. The preauricular and submaxillary glands on the affected side were enlarged. There was an increasing purulent discharge, with swelling of the lids. Two months later the right ear began to discharge. The inner half of the tarsal surface of the upper lid was covered by a dirty membrane and there were two smaller similar areas towards the outer end of the tarsus. The lower lid was similarly, but less, affected. The bulbar conjunctiva was purple in color and presented an elevation near the limbus. The cornea was cloudy and was ultimately destroyed. Only pus organisms were found.

Prophylaxis of Contagious Diseases of the Eye.—The Ophth. Soc. United Kingdom passed a resolution, introduced by **Story,** urging: (1) The danger of discharging any soldier from the army who has contracted ophthalmia until he has been certified as cured by an ophthalmic surgeon. (2) The danger of allowing any soldier suffering from ophthalmia to mix with the civil population without his having been warned as to the precautions he should take to prevent the spread of infection.

Those interested in what has culminated in the Swanley Ophthalmia School should consult **Stephenson's** interesting historical note on the development of such institutions. He shows that the impetus was given in an address to the Guardians of the City of London by the late Critchett, who, recognizing that as the disease was protracted and persistent it was apt to relapse when apparently cured and was liable to communicate a similar disease to other children, often in an acute and severe form, advised that the children so affected be placed in a school infirmary, where they should be treated the same as if they were in school. His idea was put into operation in 1873, when a school was opened and carried on for one year. Later a school was opened at Norwood, and still later the school at Hanwell was organized. The experience has demonstrated that a central isolation school was no mere Utopian dream, and that efficient medical treatment could be carried out without hampering the education of the children.

Diphtheritic and Membranous Conjunctivitis.—Siegheim studied thirty-three cases of diphtheritic and diphtheroid diseases of the eye. In fifteen of the cases an exudative diathesis, with its tendency to catarrh, probably made the diphtheritic infection easier. Specific serum therapy was the most satisfactory means of treatment.

Ricci saw a case in which a pseudomembrane developed in the conjunctiva. From smears and cultures the causative organism was found to be the micrococcus catarrhalis. There was no change under treatment with the salts of zinc, silver or mercury. But a vaccine caused improvement.

Gamal ed Dine treated five cases of pseudomembranous conjunctivitis by painting the palpebral conjunctiva with 1-1000 sublimate solution, as recommended by Fuchs. In but one did a perforating ulcer result. While by other methods of treatment, out of sixteen cases, in two both corneas were lost and six others developed ulcers of the cornea.

Conjunctivitis of the Fornix.—Santos Fernandez describes this type of conjunctivitis as showing a red and swollen line along the lower edge of the fold made by everting the upper lid. Pus may collect in the culdesac and escape local applications. It has sometimes been mistaken for trachoma. The process is not an actual inflammation. The infiltration gives rise to the sensation of a foreign body and sets up reflex twitching of the eyelids. Much twitching always calls for an examination of the culdesac. The patients have all been boys of lymphatic temperament. It therefore calls for hygienic as well as local treatment. It causes a susceptibility to infection, but is not in itself contagious.

Phlyctenular Conjunctivitis.—Steiner writes of the rarity of scrofulous affections of the eye and of scrofulosis in general in the Island of Java. He believes this to be due to the fact that because of climatic conditions the inhabitants are more scantily attired than the inhabitants of Europe and their bodies exposed to the sun's rays. He recommends giving the youth of Europe the benefit of the quasi-immunity of the Javanese by greater exposure of the body to the sun's rays and reforming the dress. He recommends for children during the warm season a garment light in weight and light in color, leaving exposed the arms, legs, part of the breast and back, no stockings, and sandals in place of shoes.

Cridland finds that in frequency eczematous conjunctivitis runs from 16.2 percent to 8.8 percent in the out-patient eye department of various hospitals in English towns and cities. He thinks that the disease is found more commonly where coal is found directly beneath the surface. As contributing causes he notes, dust, smoke, spitting, clay soil, alcoholism and raw climates. He has not found the condition frequent in localities where tuberculous patients congregate for special treatment, though he feels that in his experience the eye disease is a finger post to the presence of tubercle bacilli.

Turner is firmly convinced that the essential etiology of phlyctenules is a low-grade, chronic infection of the ethmoid cells, with obstruction to drainage, commonly following acute infectious disease of children. He believes that internal toxemias provoke congestion of the nasal membranes with aggravation of the condition. Hypertrophied tonsils and adenoids interfere with nasal lymph drainage. Faulty position of the teeth causes abnormal positions of the dental arch with varying degrees of nasal narrowing which interferes with drainage from the sinuses.

Parrot comments upon the rarity of phlyctenular conjunctivitis in native Algerians. In an experience of ten years he has seen but two cases, in children of 4 and 6 years. He quotes other observers as to the infrequency of the affection and holds that this contradicts the hypothesis of Font-Reaux that the pediculosis capitis is the causal agent of phlyctenular conjunctivitis, as these parasites are very common in Algeria.

Stargardt studied a case of pediculosis of the lid margin with the corneal microscope. He believes that the associated follicular conjunctivitis in these cases is due to irritation from the excretia of the pediculi which falls into the eye. The pediculi remain confined to the lashes and do not invade the conjunctiva.

Wolff uses the term scrofulous ophthalmia to describe cases which have at some time showed a tuberculous inflammation of the eye, leaving it hypersensitive to the tuberculous toxin. Certain lymph glands in the vicinity may also have been the seat of a tuberculous process, which may or may not have subsided into a latent state. He thinks, considering the transient process, the quick cure and the occurrence of phlyctens after tuberculin instillations, that the phlyctens are produced either by dead bacilli or by poisons. When the tuberculous toxin occasionally gets mobilized, and when it reaches the hypersensitive eye, it produces phlyctens. A course of tuberculin would aid in reducing the sensitiveness of the eye, but roentgen treatment of the tuberculous glands has proved the simplest and easiest method of eradicating the toxin generating foci.

Two interesting cases are recorded by **Milne** showing the benefit resulting from the removal of tonsils and adenoids in phlyctenular disease. In one case intense photophobia disappeared immediately following the operation, having been due to reflex action through the fifth nerve. He states, from his investigations among school children, that over 80 percent of all cases with enlarged cervical glands had definite signs of adenoids, and in most cases the tonsils were hypertrophied. This condition forms a suitable soil on which the tubercle bacillus may become implanted, and thereafter the child may get an attack of phlyctenular conjunctivitis.

Pfingst points out that the frequent presence of enlarged cervical glands in phlyctenular disease, its association with enlarged tonsils and the presence of adenoids in the nasopharynx and eczematous eruption of the face and scalp strengthens the belief that the eye disease, as well as the accompanying symptoms, are but a local manifestation of some general condition, and has led to the disease being known as scrofulous eye disease. He holds that while most ophthalmologists have always believed the efflorescences to be due to an endogenous infection, this view has not been upheld by laboratory investigation; no organisms have as yet been demonstrated in the nodules or from cultures from the nodules.

Strickler has observed a man of 30 years of age who for six months had had a recurrence of a condition resembling phlyctenular conjunctivitis. There was a small marginal bleb with a leash of blood vessels, accompanied by severe pain. Hematuria was present. The nasal condition was normal. He suspects a tuberculous origin for the symptoms.

Scott cites the case of a girl 6 years of age who suffered from photophobia of extreme type. The conjunctiva was hyperemic and there was an abundant secretion. These symptoms, of years' standing, were almost immediately relieved by the removal of adenoids and tonsils.

Stubborn Conjunctivitis.—Santos Fernandez has observed cases of conjunctivitis, almost always of a catarrhal nature, which resisted all efforts made to cure them. In some instances relapses occurred at a time when the disease was almost cured. He attributes these cases to a lack of observance of the most rudimentary hygienic principles and to the inability of patients to properly cleanse the culdesac of secretion by the usual dropping method employed. The cure of the case can only be secured by having the treatment given by the ophthalmologist or a trained assistant.

Ocular Lesions of Influenza.—In 331 cases of influenza **Stieren** saw in 16 percent acute congestion of the conjunctiva; not of the catarrhal type, but marked by a dilatation of the bulbar conjunctival vessels, with some edema of the conjunctiva, and not infrequently with small subconjunctival hemorrhages which soon became confluent. Photophobia was almost a constant symptom. In one case a young man convalescing developed a violently inflamed eye; the palpebral conjunctiva, especially of the upper lid, taking on a finely granular or mulberry appearance. A dense uniform haze of the cornea was present. No organisms were found. Various applications having been tried without favorable result, calomel was used by insufflation with good effect.

Rare Form of Conjunctivitis.—While stationed at Sofia three peculiar, but exactly similar, cases of conjunctivitis came under **Pascheff's** observation. The first or prodromal symptoms were general weakness, loss of appetite, headache and increase of temperature. The blood, urine and internal organs were negative. Only one eye was affected at a time, and the preauricular and submaxillary lymph glands were enlarged on the affected side. Locally the condition began with itching and redness of the lids. The lid borders became thickened. There was moderate photophobia and lacrimation. The tarsal conjunctiva and the conjunctiva of the fornix were somewhat thickened by infiltration, but were smooth. Minute points and spots, which varied in size, were seen in the conjunctiva, especially of the tarsus and fornix. The spots had ill-defined edges, were entirely superficial, and when their surface was rubbed some necrotic tissue was scraped away and left a shallow superficial ulcer, which healed without the production of a scar. The disease has three stages: (1) formation of conjunctival necrotic areas; (2) stage of ulceration; (3) stage of repair. The conjunctival process covers between two and three weeks. The involvement of the lymph glands lasts longer than the conjunctival process, and the skin covering them is red and painful to the touch.

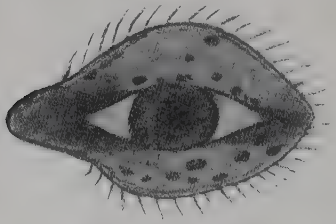

Fig. 7. Location of small necrotic areas on palpebral conjunctiva. (Pascheff.)

The author injected material gathered from the conjunctiva into guinea pigs. The pigs died in from seven to eight days. Infected material injected into the anterior chamber of rabbits' eyes resulted in death of the rabbit in one month or more. Small white areas resembling the conjunctival lesions of man were found in the parenchyma of the spleen of the dead animals. A micrococcus 0.25 to 3 m. in diameter was isolated and grown. It was gram negative, anaerobic and aerobic. In boullion the organism clouded the media, coagulated milk, produced gas, was slightly fluorescent, and did not produce acids or indol. Badet and Gengon reaction with serum gave positive results. Both the injection of secretion and of cultures produced disease in animals. The author calls the organism "micrococcus polymorphus necroticans". The necrosis develops rapidly, does not spread except by continuity, giant cells and caseation do not occur.

Pneumococcus Conjunctivitis.—**Bowman** found that an aqueous solution of optochin caused the pneumococcus to disappear in this type of conjunctivitis in from three to five days, as a rule.

Ito states that remijin, a drug introduced by Professor Takahashi of Tokio, is identical with ethylhydrocuprein or optochin in its specific action against the pneumococcus.

Action of the Meningococcus on the Eye.—**Guglianetti's** conclusions as to the pathogenicity of the meningococcus for various tissues of the rabbit's eye are, that it induces inflammatory processes when injected into or beneath the various tissues, with the exception of the conjunctiva. There was no reaction even to the subconjunctival injection of these germs.

Habronemic Conjunctivitis. — Lewis and **Seddon** have observed several cases of conjunctivitis in horses, induced by the presence of a larval nematode — habronemia megastana. The cases presented granulomatous masses with caseous areas in the conjunctiva of the lids, or whitish scars which probably indicated absorbed necrotic areas. The parasite was contained within a canal in the necrotic area. The area was embedded in soft vascular fibrous tissue.

Conjunctivitis Due to Typhoid Bacillus.—Mohr saw a subacute type of conjunctivitis provoked by the accidental introduction of a culture of typhoid bacillus. Cultures confirmed the nature of the inflammation which persisted for eight days.

Zankowich reports a case in a physician who accidentally squirted serum which contained typhoid bacilli into his eye. The face was washed with alcohol and the eye with water. A mild conjunctivitis followed, and pure cultures of typhoid bacilli were obtained from the secretion. Four days later, after treatment with collyria and boric acid, the conjunctiva became nearly normal, and examination for bacilli, including cultures, was negative. Three weeks later the physician developed a mild case of typhoid. The author believes that there is a possibility that the bacilli might have traveled from the eye into the nose and alimentary tract.

Strader showed a case of ulcer in which it was impossible to definitely determine the cause. The first symptoms were smarting of the lids, with redness and chemosis of the conjunctiva. The next day a superficial ulcer developed on the conjunctival surface of the lower lid. The preauricular glands were slightly swollen and tender. The ulcer progressed until nearly the entire surface of the lower lid was involved. An organism similar to Vincent's fusiform bacillus was found, but no spirochetes. The Wassermann reaction was negative. The ulcer diminished in size after the local application of trichloracetic acid.

Food Anaphylaxis Conjunctivitis.—Conlon gives the clinical notes of three cases of conjunctivitis unaccompanied by any other manifestation, which he believes were provoked by proteins of commonly used foods. In the first case the patient had suffered for five or six years with swollen and reddened lids, with slight ptosis and hyperemia of the entire conjunctiva. This condition could be excited by eating, or avoided by abstaining from eating, of either strawberries or tomatoes. The skin test was negative. In the second case a man 56 years of age had had for four or five years a sensation of sand in the eyes and of sudden lacrimation. All of the usual methods of treatment were without benefit, but with the withdrawal of eggs from his diet the condition disappeared. The protein test for eggs was positive. In the third patient an inflammation of the lids remitted from eating flounders. A homemade protein produced a positive reaction.

Artificially Produced Ophthalmia.—McPherson and **Doyne** state that this is a condition common among Indian troops and followers in the Mesopotamian Expeditionary Force. During 1917-18 there were 136 cases recorded. The substances mostly used are jequirity, croton oil and castor oil beans. One of the characteristics of the condition is the absence of or scantiness of discharge. Such an intense inflammation induced by bacterial causes would at least give rise to a profuse discharge.

Azmy found simulated conjunctivitis quite common among policemen and ghaffins. The irritants used were principally soap, mortar and red pepper placed in the lower fornix. (See p. 10.)

Vernal Conjunctivitis.—Girgis, noting the frequency with which trachoma patients complained of itching, examined for eosinophiles and found them present in eight cases in males from 5 to 35 years of age of different occupations. **Brinton** again brings forward his views concerning the relation between spring catarrh and adenoids with diseased tonsils. He thinks he has seen at least 100 cases since his first published thirty-three, and, while all were not subjected to removal of the tonsils, a great many of the milder cases got well by cleansing up the tonsils with chlorate of potash and other agents.

Heed's case was exceptional in the extensive involvement of the corneal limbus. The tissue was thickened and spread over four-fifths of the corneal surface in each eye. In the discussion Shumway thought that the condition bore some resemblance to trachoma. Zentmayer said that the mechanical ptosis, thickened appearance of the lids with somewhat gelatinous infiltration of the conjunctiva of the upper lids with the unusual hyperplasia of the limbal tissue, suggests that the case may belong to the class reported by May of mixed trachoma and vernal conjunctivitis.

Gonzalez again calls attention to his observation that vernal conjunctivitis may cause to develop an irregular astigmatism in eyes previously emmetropic. In a recent case, in an eye known to have been emmetropic, keratoconus resulted, the eye showing a high myopic astigmatism. There was no hereditary factor. He explains the development by the appearance of the conjunctivitis in the eyes of children, eyes in the course of development, nutritive modifications induced by the pericorneal infiltration, the mechanical influence of pressure and friction through the closed lids by the fingers.

Simon de Guilleuma has applied radium by ionization. The electrode consists of an instrument like the Desmarres forceps, one blade of which carries a pad of cotton to contain the electrolyte. This consists of a solution of radium bromide, one millionth of a gramme to one cc. The current is worked up from zero to one milliampere within ten minutes, and then an equally gradual descent to zero. In the case cited twelve sittings were given within forty-nine days. The patient has remained unaffected through two spring seasons.

Gonzalez reports several cases to show that x-rays have an evident therapeutic value. In one of especial interest, a large recurrent vegetation invaded the cornea, but yielded to x-rays.

Natural History of Trachoma.—Collins states that it is now generally admitted that trachoma is contagious by transference of moist discharge from one person's eyes to another. The contagious factor is probably an ultramicroscopic organism. He would define trachoma as a chronic disease which is confined to the conjunctiva, and which is characterized by a new formation within it of lymphoid tissue. The distinction between "follicular conjunctivitis" and trachoma lies in the fact that in the former only an enlargement of the normal lymph follicles takes place, due to the presence of a chemical irritant. Whilst in trachoma there is an invasion of the subepithelial tissue itself by microorganisms which have penetrated the outer defenses of the epithelium and then become surrounded by a new formation of lymphoid tissue. In the condition termed trachomatous pannus, there is a new formation of lymphoid tissue and blood vessels beneath the epithelium of the cornea, between it and Bowman's membrane.

At present it is difficult to state whether trachoma ever involves the lacrimal sac. He has seen no evidence of it in the schools for treating this disease. The tendency that trachoma follicles have to make their way to the surface, degenerate and expel their contents, can be hastened by the operation of expression. However chronic a case of trachoma may be, there is always a certain amount of phagocytosis excited. The value of sulphate of copper lies in the special and peculiar property it possesses of exciting phagocytic exudate. One of the best methods of producing phagocytosis is by the use of carbon dioxide snow. One of the ways trachoma comes to a natural termination is by the new formation of fibrous tissue, replacing the subepithelial areola tissue. Grattage probably acts by hastening this formation.

Mayou points out that it takes from one to three weeks after birth before the loose connective tissue of the fornices are filled with lymphoid cells. These are derived almost entirely locally from the endothelium of the conjunctiva. If an irritant be applied, or if a bacterial infection occur, there is a call for more of these cells and follicles are formed. These follicles are identical with follicles found elsewhere in the lymph glands and become the seat of disease in the same way. In so-called follicular conjunctivitis you see the normal lymphoid layer surrounded by a thin layer of endothelium containing mononuclear cells, ordinary lymphocytes, plasma cells, endothelial and various other cells in transitional state. Leading from the follicles are efferent vessels filled with these cells. When the lymphoid tissue becomes the seat of disease, as in trachoma, there is a necrosis of the lymphoid tissue.

When these follicles are the subject of trachoma, the disease shows itself in the central part of the follicle; the plasma cells show the necrosis most markedly so that from the center of the follicle the plasma cells tend to disappear. The breaking up of the cells is manifested by some of the cytoplasm, which shows pink, lying free in the follicle. The endothelial cells of the follicle pick up the debris of the plasma and other cells and digest them. The debris was mistaken for trachoma organisms, and is nothing more than semidigested cell nuclei. Cut sections of the conjunctiva with trachoma show many follicles with no necrosis in the center—healthy lymphoid follicles. Pannus is undoubtedly a trachomatous infection. Mayou has had wonderful results from jequiritol in greatest strength, without bad results.

Experimenting with apes, **Sakaguchi** found that inoculation with the virus of trachoma was followed in two to five days by inflammation, and in seven to ten days the formation of trachoma granules. The so-called trachoma bodies could be recognized by staining at about five days. Apes could be reinfected with trachoma so that no immunity toward it could be supposed.

Wakisaka finds trachoma bodies are more like granulomas than follicles.

Hiwatari concludes that the substantia propria, the plasma cells of Marschalkos and lymphocytes, is more or less richly endowed with the histocytes (Kiyonos). The last two named cells are less frequently met with. The substantia propria, contrary to the widely current assumption, has no adenoid properties, as Virchow correctly asserted. Lymph nodes are not normally present in the conjunctiva; they are always a reaction product of the tissue against external irritation. Towards the formation of follicles in the conjunctiva there are two other factors. These are constitutional and local tissue predisposition. The two latter factors are associated on one side with age and on the other with the varying anatomical structure of varying parts of conjunctiva. Especially are the different degrees of cell richness in the subepithelial layers and the type of the epithelium (cylindrical or flat) of particular importance.

In trachoma, beside lymph node formation and increase in the histocytes and plasma cells, early there is a growth of fibroblasts so that a peculiar granulation tissue is formed in the subepithelial layer. Trachoma is therefore a type of chronic granulation inflammation. Granulations and lymph node formations are necessary in trachoma pathology, as they represent the reaction product of the tissue against trachoma virus. The first is the more important, as granulation formation is everywhere met with where trachoma is unhealed while the follicles are present when the tissue disposition is scantily developed and may be absent—for instance, in the bulbar conjunctiva and in pannus. The question of follicles in pannus is to be answered in the affirmative, but not in the sense that the trachoma process, as such, alone, is capable of producing follicles unaided, as asserted by Axenfeld and Komoto. Against this method of their production is their rarity.

Eaton has investigated scar tissue conjunctivitis, but his final conclusions are not yet published.

Hine examined 100 definite trachoma cases with a loupe and found that forty-one cases had pannus. There were seven severe cases, sixteen slight, and in eighteen the vessels could only be detected with a loupe.

In the trachoma hospital in Neutra, **Terc** treated 6,000 cases of trachoma. Diagnosis and differential diagnosis of beginning trachoma is discussed by **Lindner.**

Hiwatari reports a case which he believes to be unique. In a woman 21 years of age with a mild grade of trachomatous scarring in each eye, there was present in the left eye a tumor of the caruncle. It was of the size of a rice grain and grayish-yellow in color. Histologic examination showed the presence of closely approximated lymph nodes with a well-developed germinating center. Numerous Leber bodies were present. There was a deep cone-shaped depression between two neighboring follicles, lined with stratified pavement epithelium. Within the lumen and between the epithelial cells there were lymphocytes, histocytes and polynuclear leukocytes. The case bears out the opinion that while the caruncle resembles, histologically mostly, the structure of the skin, it also shows the nature of mucous membrane.

Inouye, in studying the condition of the conjunctival limbus in trachoma, found in one group of patients that the limbus was irregular because of the presence of large spots. In another group round or oval rings with translucent centers which varied from the size of millet seeds to rice kernels were seen. Small capillaries which communicated with the superficial conjunctival vessels often passed from one to another follicle. The granulations of the limbus were ultimately absorbed and disappear in the stage of cicatrization.

Prevention of Trachoma.—Cunningham and **Wharton** describe the method employed by the British to prevent the spreading of trachoma among the Chinese and Egyptian labor companies during the war. The active cases of trachoma among the Egyptians were 19 percent, and 9 percent in the Chinese companies. The men were divided into three classes, i. e., those with normal conjunctivas, cases with conjunctivitis without definite evidence of trachoma, and men affected with trachoma. The infected cases were placed in conjunctivitis and trachoma companies and were separated from the non-trachomatous laborers. A universal drop treatment was carried out and each laborer in the clean, as well as the infected, companies had a couple of drops of a solution which contained 2 grains of zinc sulphate and 10 grains of boric acid to the ounce of water dropped into his conjunctival sac daily. The infected companies were inspected frequently to note the progress of the disease and to institute special treatment for the cases requiring it. By this method of isolation and treatment the spread of the disease was controlled and the efficiency of the units was materially increased.

Derby gives an account of the methods used in France to prevent the spread of trachoma among the labor companies employed. He states that there were 12,461 laborers, made up of North Chinese, Indo-Chinese, North Africans and mixed races, employed by the A. E. F. Among them were 1,618 cases of conjunctivitis, 13 percent; 216 cases of trachoma, 2 percent. The procedure was similar in the separation and classification to that employed by the British. He states that only a comparatively small number of cases of trachoma were found among our soldiers in France.

Jouveau Dubreuil gives the results of the examination of cases seen at the French military hospital and the dispensary, Pé Mu Setchouen, China. Among 1,067 individuals, 57.13 percent were unaffected, 25.58 percent were active, 16.77 percent cicatricial. In fifteen cases there were palpebral complications, in thirty-seven corneal complications, and in eight blindness.

Lister bears testimony to the splendid work done by Cunningham in connection with the trachoma problem in France. It was largely the work at the headquarters in properly classifying the cases. Among 4,500 Chinese there were three companies (about 1,000), and two chronic conjunctivitis or "doubtful companies". A very large percentage of the cases were uncomplicated, with very little papillary hypertrophy and mostly small pin-head follicles scattered about the tarsus. Little inconvenience was experienced and improvement under treatment was rapid. The value of expression was marked. Very few complications were seen. Of corneal ulceration, six severe cases and eighteen very slight were noted. From his experience at Camp Jackson, **Chance** concludes that trachoma did not constitute a serious problem. During a larger part of the period of the war but thirty-five men had been rejected from the service and only twenty-six had been treated at the hospital.

Thierry, from twenty years of experience in Valparaiso, concludes that trachoma is evidently becoming more prevalent, mostly due to imported cases. He urges stricter measures against its introduction into the country, saying that every one thousand dollars spent now for this purpose represents the saving of a million later.

Of 73,480 school children examined in Amsterdam by **Mouton**, 1,019 were found to be infected with trachoma. Of the Christian children, 0.6 percent were affected; of the Jewish, 8.8 percent. After a census of the homes was taken, it was concluded that the Jewish children contracted the infection in their homes, while the others contracted it at school. Bosnia and Herzegovina had been free from trachoma before the war. With the advent of infected soldiers, the disease began to increase alarmingly. **Löwenstein** describes how the prophylaxis and treatment was carried out in this district.

Pacheco Luna finds that trachoma is a rare disease in Guatemala—he has never found it in the creoles or natives. All are imported cases, which rapidly lose their contagiousness. He attributes this to climatic conditions. **Troncoso** believes it due rather to scarcity of immigration. **Burga** states that from 1910-1916 the range of cases of trachoma at the eye infirmary at Lima was from five to fourteen. Almost all were imported. In the four cases seen in 1914 there was inherited or acquired syphilis in two, tuberculosis in one. The fourth case was a miner.

Würdemann has been struck by the relative scarcity of trachoma on the Pacific Coast. This is remarkable because 80 percent of the population are transplanted from other parts of America, with a great mixture of foreign element from all parts of the globe. The coast Indian tribes are not at all affected. He ascribes this relative immunity to absence of flies, dust, the cool, equitable and moist climate, as well as to the character of the soil, which is mostly a loam upon gravel or hardpan, there being very little fine sand or clay to form dust; finally, the outdoor life of the people. In commenting upon the above, **Wing** recalls when trachoma was very prevalent among several Indian tribes and among the inmates of Indian schools. Likewise it was very common among the whites of Tacoma and Puget Sound, especially from 1890-1910. In the past ten years it has been uncommon. This is due principally to better treatment and hygienic surroundings. Whether climate had any influence over its control is considered very questionable.

Penichet surveys the prevalence of trachoma in Cuba.

Santos Fernandez writes on the difference in trachoma as seen in Cuba from the typical disease as seen elsewhere. He has seen the most typical case in a woman 40 years of age. Males are more commonly affected. The disease is not modified by the spring months. In his many years of practice he has seen very few cases of trachoma completely cured. When the eye disease is unilateral or easily cured, trachoma can be excluded. It is a disease of poverty and filth.

McCallan has found that trachoma is a protection against attacks of gonococcal conjunctivitis and against its more harmful results.

Hühn observed twenty cases of trachoma in whom scarlet fever developed. In all local treatment to the eyes was discontinued. Much to the author's surprise, the thickening of the lids and other trachomatous changes improved quite decidedly. The author believes that either scarlet fever or the high temperature which accompanies it has a favorable influence on trachoma. Measles and erysipelas had very little influence on cases of trachoma which came under his observation.

Treatment of Trachoma.—While Mayou has been very much pleased with the result obtained with jequiritol,

Story has used the drug with great care, using Nos. 1 to 4, but has not found any of them of any real good. He has, however, found the old infusion of jequirity in cold water most excellent in pannus. Sometimes it had to be used over and over before the pannus cleared. He has found the sulphate of copper the most efficient chemical remedy for the disease. **Elliot,** from personal experience, found the application of nitrate of silver awfully painful, but he got accustomed to it, and later he could have a 3 percent solution painted on the conjunctiva and do his hospital work at once.

In treating trachoma, **Elschnig** uses oxycyanate of mercury in a 1 to 5,000 solution every hour. When possible, the lids were everted and flushed with the solution. Expression is done when indicated, and as soon as the follicles disappear the author discontinues the oxycyanate of mercury and uses a 1 percent solution of silver nitrate until the secretion subsides, at which time the copper pencil or a 5-10 percent copper citrate salve is prescribed.

Howley, after three years' experience with a form of treatment which he terms "negative pressure", believes it to be especially valuable in those cases of trachoma which are not operable, but are so chronic in character that they are almost incurable. The implement employed consists of a pump to which is attached a glass tube 120 mm. in length with a curved end 4x3 mm.—there is a central bulb or chamber to hold the secretions which are drawn off. Five mm. back of this is a small opening for the finger of the manipulator to make or break a vacuum. The amount of negative pressure should be determined by the sensitiveness of the patient as the applicator is swept across the lid. The application of the suction may be preceded by scraping or by scarifying the membrane. The sittings are repeated two or three times a week.

Blatt describes a method of treatment which he styles "aspiration". The aspirator consists of an eye pipette in which the rubber bulb has been transferred to the pointed end of the dropper. After proper preparation of the conjunctiva, the end of the tube is applied to the conjunctival surface after the air has been exhausted from the tube by pressure applied to the rubber bulb. Promptly the included portion of the conjunctiva takes on a deep red as superficial hemorrhages appear, and a pulp-like substance exudes into the tube. The tube is allowed to remain in situ and air is slowly admitted so that its removal can be readily accomplished. In this way the entire surface of the membrane is gone over. In cases with diffuse infiltration and thickening an aspirating pump can be attached to the tube. The advantages claimed for the method is that no traumatism results, that the entire contents of each and every follicle in all parts of the conjunctiva can be reached, and that the hyperemia produced is of considerable curative value.

McPhail practices expression, "thus converting a chronic into an acute condition," more amenable to treatment. A 1 percent solution of corrosive sublimate is applied to the fresh surface.

Crigler records two cases of advanced trachoma with pannus operated upon by the Heisrath-Kuhnt method. In the first case but one eye was operated upon, and the patient returned seven years later to have the other eye similarly treated. There had been no recurrence in the first eye. The second case had been operated upon two years previously with entire disappearance of pannus and no recurrence. In discussion Knapp made known that Kuhnt's successor does not do the combined excision operation. Davis condemned the operation. Wootten, who has had a large experience with the operation, could not see why there should be any aversion to the operation in view of the satisfactory results obtained and reported. Cohen was convinced of the efficacy of the procedure. In performing this operation **Smith** makes the tarsal incision so that the remaining strip of tissue is a little wider in the middle than at either end. He believes that the operation of excision should not be done in any but the late stages of the disease. If acute pannus is present no operative procedure whatever should be done.

Hiwatari operates for trachomatous pannus by detaching the conjunctiva at the corneal limbus after disinfecting the lids and conjunctiva and the use of subconjunctival injections of cocain. A flat incision is made parallel with the upper margin of the tarsus from the outer to the inner canthus through the fornix or bulbar conjunctiva. Three suture threads are introduced through the lower lip of the wound in the form of loops. By means of traction upon these the detachment of the conjunctiva is facilitated. The separation must extend down to the cornea and extend towards the median and lateral sides. Only at the limbus is the separation difficult. The incised wound of the conjunctiva is sutured continuously towards the canthi by means of the middle loop, the ends being attached to the skin at either end. The blood vessels in the pannus diminished gradually and later disappeared entirely.

In **Tyrrell's** hands carbon dioxide snow proved to be the most satisfactory treatment for trachoma. The lids were cocainized and the snow applied for about thirty seconds. The interval between applications was from fourteen to twenty-one days. Radium was of little value in his cases. Treatment by the x-ray is satisfactory, but difficult to carry out.

Blackburn reports a case of trachoma which was markedly benefited by local application of Bulgarian bacillus to the conjunctiva.

Rau recommends, in severe chronic granular disease of the conjunctiva not benefited by removal of the granulations with the curette, galvano-caustic, electrolysis, etc., that the silver nitrate pencil be used. After the application the conjunctival sac is washed out with salt water. In a few days a gray scab comes off and the granulations are smaller. This process should be repeated, and in ten days the granulations disappear. After a fortnight's treatment with silver nitrate, the conjunctiva is treated for four or five weeks with the copper pencil.

Conjunctivitis Petrificans. — Wirths observed a case which he believed could be classified as conjunctivitis petrificans. The conjunctiva had been burned by lime. A symbelpharon was present. Chalky concretions were noted in certain parts of the conjunctiva. The borders of some of the concretions were surrounded by a yellowish necrotic zone. The case resembled conjunctivitis petrificans, but was not typical of the disease as described by Leber, 1895. The author enumerates the classical symptoms of the disease and reviews the literature up to the present time.

Parinaud's Conjunctivitis.—Ishiwara obtained a cure by the use of the x-ray on a 15-year-old girl who had the characteristic appearances of Parinaud's conjunctivitis.

Tuberculosis of the Conjunctiva.— Cohen's patient was a boy 8½ years of age. The conjunctival condition was of ten weeks' duration. The lid was decidedly thickened, the conjunctiva presented numerous isolated raised papules about the size of a pin's head. Scattered over the same area were yellowish nodules of the same size and smaller. The surface of the conjunctiva was frequently covered by a yellowish exudate, the removal of which produced bleeding. The lymph glands on the same side were enlarged. The general tuberculin reaction was positive. The history, physical examination and bacteriologic examinations were all negative. Sporotrichosis was excluded.

Bayer describes the eruption of evanescent tubercles in the bulbar conjunctiva accompanying bulbar tuberculosis. He reports two cases. The first was a girl 9 years old with a positive family history for tuberculosis. She had a suppuration of the ear, phlyctenular disease and scrofula. There were several very fine papules of the bulbar conjunctiva. One mm. from the temporal limbus a 3 mm. papule containing a clear grayish-yellow substance, over which the unaffected bulbar conjunctiva was freely movable, surrounded by a slight episcleral injection, was noted. One of the tubercles was excised and showed a typical tuberculous picture, with numerous epithelioid cells, genuine giant cells of the Langhan type and caseation. Gradually the conjunctiva took on a nodulated appearance, and in the limbus one could see a number of small elevations which, with the exception of their non-inflammatory character, reminded one of phlyctenules. Later a typical phlyctenule appeared on the conjunctiva. The phlyctenule seemed to disappear after a short time, but the nodules were continually forming and disappearing.

A second patient, who had similar nodules, came under the author's observation. No phlyctenules were present at any time. In her left eye there were several infiltrations in the upper corneal margin and one in the center of the cornea. The iris was hyperemic. The tuberculous character of the condition in this case was diagnosed after a 5 mg. injection of old tuberculin. The condition gradually improved under tuberculin treatment. A year later there was a relapse with increase of tension. The condition improved under treatment and was quiet for three months, when there was a third relapse with the appearance of two tubercles. The nodules finally disappeared and the patient was discharged as cured. Bayer illustrated the various positions of the tubercles by means of a series of very ingenious drawings.

Patterson's patient was a boy 13 years of age, who for some weeks previous to the ocular disease had an enlarged parotid gland. The upper lid was thickened and there was a large mass of granulation-like tissue, mostly surrounded by a yellowish spot high up in the culdesac. The tonsils, which were enlarged and cheesy, were removed. Tubercle bacilli were found in the masses of caseation. Under the use of trichloractic acid and tuberculin 1/10000 mg. increased to 1/5000 cicatrization took place.

Paterson observed a case which was in all probability one of granular tuberculosis of the conjunctiva in a man 23 years of age who was suffering from tuberculosis of the lungs and larynx. The ocular condition had been in progress about three months when treatment by instillations of dilutions of O. T. beginning with two drops of 0.00001 and increased slowly up to a 1 percent solution. The latter dose was followed by marked dilatation of the conjunctival vessels, increase in secretion and pain. This dosage was continued at intervals of ten days for six doses, and at the end of this time all of the symptoms had disappeared. There remained, seemingly, a slight mechanical ptosis. Tubercle bacilli were not demonstrated and no histologic study of the granulations was made for fear an ulcer would develop at the site of the wound if tubercle bacilli were present.

Goto describes a case of conjunctival tuberculosis which extended from the tarsal conjunctiva to the bulbar conjunctiva, and a typical case of epibulbar tuberculosis. The author thinks that in both cases the infection was carried to the eye by the blood stream.

In **Gallemaerts'** case the patient was aged 44 years, with pulmonary tuberculosis. Redness of the conjunctiva had first been noticed three weeks before. There was a violaceous swelling about the size of the head of a pin 4 mm. from the limbus between the internal and inferior recti in the episcleral tissue. In a few days it increased in size and became more inflamed. On puncture a small amount of grumous pus exuded. This did not affect the progress of the case. Later it was curetted and a thermocautery applied. It now grew to the size of 5 by 8 mm. and the summit ulcerated. The diseased tissue was then excised and a cure effected. No inoculation experiments were possible. Histologic study confirmed the diagnosis. He believes the infection to have been due to the arrest of an erythrobacillary embolus from the lungs in a ciliary artery.

Basterra has met with both primary and secondary tuberculosis of the conjunctiva. He found it more frequently in girls and women than in the male. The majority of the patients were between 10 and 30 years. The conjunctiva of the lids and tarsus was mostly affected. If the lesion is not very extensive it yields to touching with 50 percent of lactic acid.

In a case of tuberculosis of the conjunctiva resembling Parinaud's conjunctivitis, **Musy** was able to demonstrate that the tubercle bacilli present were of the bovine type.

Conjunctival Scars from Inherited Lues.—In a girl 7 years of age, with facial and dental signs of syphilis, **Griscom** saw a cicatricial condition of the conjunctiva of both upper and lower lids. The appearances were those of cicatricial trachoma. In the absence of a family history of trachoma, of any present or past evidences of corneal involvement or distortion of the lids, it was considered that the condition was the result of prenatal syphilis with probable formation of conjunctival gummata.

Pemphigus of Conjunctiva.—**Clapp's** patient was a man 70 years of age who gave an indefinite history of eye trouble since his fourteenth year, with operation for entropion at that time. There were bands across the fornices, with superficial vascularity of the cornea in one eye. A very dry, dense, white, leathery opacity occupied the center of the cornea. A diagnosis of trachoma had been made by several clinicians.

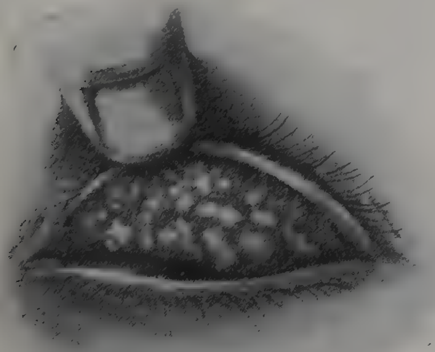

Fig. 8. Appearance of palpebral conjunctiva in case of deposits of fat in that membrane. (Elschnig.)

Fat Deposits in Conjunctiva.—Two cases with peculiar fat deposits in the conjunctiva were seen by **Elschnig**. The first was in a girl of 15 years. There was a scleritis and sclero-keratitis of the left eye. The tarsus of the upper lid was thickened and grayish colored papules ½ mm. in diameter were noted in the conjunctiva. The papules were made up of minute fat globules. Irregularly placed vessels in the form of loops surrounded the papules. The conjunctiva of the fornix was hyperemic, but not invaded with fat. The second case showed similar changes. The author believes that the condition is a reactive inflammation of the conjunctival tissue with the deposit of fat.

Streptotrichosis.—**Pereyra's** patient was a female, aged 29 years. The condition started with pain and lacrimation in the left eye, and some days later the right eye became affected. The superior conjunctiva presented a congested and edematous appearance over an area of 2 mm., corresponding to the junction of the outer with the middle third. The skin of the free border of the lid was reddened. At the free border were yellowish nodules with a diameter of 1 mm. There were other similar nodes in the conjunctiva adjacent. Cultures grew a gram positive bacillus. Some were in the stage of segmentation, others in the spore stage. Histologically, there were epithelioid cells of various types, with polynuclear leucocytes and giant cells. Inoculation experiments produced a mild iridocyclitis, with the same histologic characteristics as were present in the eye enucleated after the introduction into the anterior chamber of the streptotrix.

Epithelial Xerosis.—In three cases of epithelial xerosis of the conjunctiva observed by **Archibald**, diphtheroid bacilli allied to the bacillus xerosis type were present in the xerotic areas. Experimental inoculation with material obtained from one of the cases produced a xerosis of the conjunctiva in a rabbit.

From the critical analysis of previous experimentation and from the results of her own, **Bulley** is convinced that with the avoidance of initial infection experimental animals can be kept almost entirely free from the so-called deficiency disease, whether fat soluble A be present or absent, and that it is dangerous to draw conclusions as to the fat soluble A content of any diet from the appearance of xerophthalmia.

The Medical Research Committee and the Lister Institute state that xerophthalmia has been attributed to a shortage of fat soluble growth factor which causes rickets. The most striking example of a local cause is the keratomalacia which may follow severe optic neuritis. The babies are small and ill fed, the conjunctiva is dry and insensitive, the fornix filled with rolls of dry, curdy material, swarming with microorganisms consisting of the most part of the xerosis bacillus. The condition will clear up if the nutrition is promoted by the use of cod liver oil by the mouth and by inunction, and by the local use of castor oil.

A second type, not very rare and of no serious consequence, is seen in school children in hot weather. The conjunctiva of the fissural space is covered by plaques of thick grease-like material, composed of the debris of epithelial cells, swarming with xerosis bacilli. There may be night blindness, suggestive of nutritional defect. The plaques have been known to persist for years, but mostly they respond to the treatment outlined. Anomalous cases with persistence of the plaques have been found in association with optic neuritis in a case of tabes, and in a schoolboy, the inmate of a first-rate blind school where the dietary was exemplary. Xerophthalmia has been produced in animals within a fortnight after the animal has been placed upon a diet deficient in the fat soluble factor.

Conjunctival Hemorrhage.—This condition was seen by **Fernandez** in a man 26 years of age. Twenty to thirty hemorrhagic foci were present in both bulbar and lower conjunctivae. They were of the size of a millet seed and were symmetrically placed. The only possible etiologic factor was excessive crying several days previously.

Penichet saw a case of epilepsy in which a profuse hemorrhage into the anterior chamber, accompanied by a total subconjunctival ecchymosis of both eyes, occurred after each seizure.

Nakamura and **Mazumoto** report a death due to uncontrollable hemorrhage from the conjunctiva of a strong, newborn babe. The mother had suffered from nephritis, beriberi, and died from puerperal fever. Silver solution was instilled into both eyes. An uncontrollable hemorrhage from an oblique tear 6 by 7 mm. in the lower conjunctiva occurred. Hemorrhage from the nose appeared later and the two caused the child to bleed to death. The authors do not believe that the instillation of silver solution was to blame in their case, as no hemorrhage occurred from the other eye; but they think that the child had a lowered coagulability of the blood because of the presence of nephritis and beriberi in the mother.

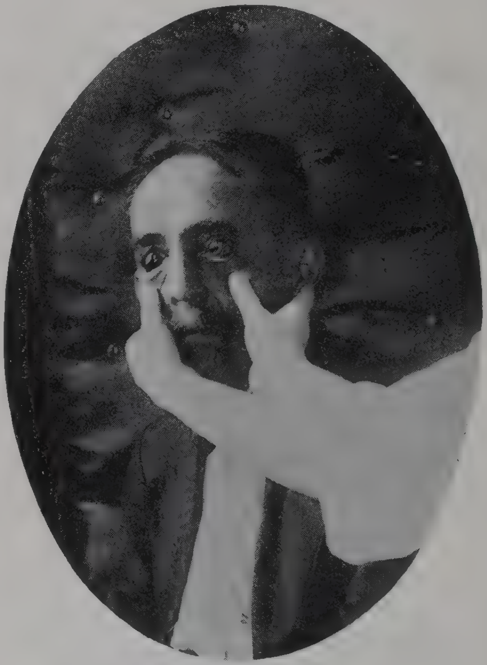

Fig. 9. Extensive subconjunctival hemorrhage recurring with epileptic attacks. (Penichet.)

Edgar reports having seen recurrent serious bleeding from the conjunctiva of one eye in a new-born child following the use of a supposedly 2 percent solution of silver nitrate by a practical nurse. The lids of the affected eye became greatly swollen. At the age of 2 months, when first seen by Edgar, there was a tendency to inversion of the upper eyelid, and there was a deep central leucoma. There was no history of hemophilia and repeated coagulation time tests were made and found normal. That only one eye was affected may be explained by supposing that little or none of the silver solution got into the other eye.

Total Symblepharon.—As the result of an extended experience, **Morax** has modified somewhat his procedure in total symblepharon, particularly where the socket is too contracted to carry a shell. A horizontal incision extending at least 1 cm. beyond each canthus is made between the lids, and is carried above and below parallel with the plane of the skin and passing behind the orbicularis. The lower lip of the flap is fixed by a series of fine sutures. A second incision is made on a level with the eyebrow and fixed by the upper lip of the wound. The everted lids are then fixed to the superior and inferior flaps. Upon this large surface epithelial grafts are placed. A paraffin mould is placed to maintain a separation of the flaps and as a base for the grafts. The accumulation of serum and dead epithelum is prevented by not suturing the canthi at the time that the lids are sutured. They are sutured some days after the lids are freed.

Argyrosis.—**Weeks** saw this condition in a male, Russian, 68 years of age. Eighteen years previously Weeks had operated upon the same patient for trichiasis. At present there is a very marked pigmentation of the ocular conjunctiva, it being almost black. The corneas are stained dark brown. Injections of 1 percent solution of potassium iodide subconjunctivally were without effect.

Emphysema.—**Israel** reports a case of emphysema of the conjunctiva resulting from the eye being struck by a compressed air stream. The swelling involved the conjunctiva of the lower lid and of the lower-inner quadrant of the globe. Crepitation was present. There was no immediate discomfort, but the patient was unable to open the eye. Recovery occurred in four days.

The Cornea and Sclera

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This section reviews the literature of 1919. For previous references see A. J. O., April, 1919, p. 65.

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DIGEST OF THE LITERATURE.

Corneal Nerves.—Strebel can demonstrate the nerve fibres of the living cornea by means of focal illumination with a Nernst lamp and a corneal microscope. The nerve fibres appear as very fine, silver gray, opaque, round little bundles, in the depth of the corneal parenchyma proper. They traverse a wavy course, coming gradually nearer the surface as they extend into the cornea from the limbus, and end immediately beneath the corneal epithelium.

Reflexes.—Heinen has observed a secondary movement in the corneal reflexes. In producing the great corneal reflex in slight narcosis, the eyelids come together, but in deep narcosis the eyelids only make an incomplete movement, resembling a contraction of the orbicularis oculi. The contraction can be plainly seen because the lashes come together. In producing the small corneal reflex in slight narcosis, the pupils are not yet dilated and react readily to light. In this condition most operations can be performed. But in deep operations the narcosis must be deep enough to dilate the pupil maximally.

Friedman points out a valuable diagnostic sign of coma due to hemiplegia. The sign is unilateral anesthesia of the cornea on the side of the hemiplegia. This would be the side opposite the lesion.

Strebel has noticed that when the surface of the cornea is bedrizzled with some indifferent fluid, such as saline solution, there is a reflex swallowing movement in addition to the reflex lid closing, this reflex being apparent in the newly born if cold water is used. He found the reflex in 85 percent of fluenzal herpes of the cornea.
500 people tested. The reflex was absent in eleven cases of herpes of the cornea, also in seventeen cases of in-

Corneal Corpuscles.—Willetts presents a third paper on the study of the white corpuscle from observation of its circulation through the cornea. From repeated observations and study he believes that the true function of the white corpuscle is outside of the blood stream, and that the number outside of the blood stream is much greater than is generally supposed. The author has estimated that through a given visible point in the lymphatic system of the cornea, 8,640,000 white corpuscles pass in twenty-four hours.

Fischel has written on the development and nutrition of the cornea.

Congenital Anomalies. — Waardenburg reports several cases of melanosis of the cornea, which the author regarded as a congenital pigmentation, and not an actual melanosis. He found no evidence of a familial or hereditary character in the anomaly. Vision was not interfered with. There was symmetrical pigmentation in one or in both eyes in the form of dark brown stripes, horizontal or vertical, or they appeared as stippled areas.

Wirths reports on congenital changes in the cornea, and **Hinneberg** on congenital opacities of the cornea.

Gallemaerts reports a case of corneal dermoid and subconjunctival lipoma in a woman aged 37. In addition, there was a choroidal coloboma. He regards all three lesions as due to formations of amniotic bands and adhesions, producing narrowing of the amniotic cavity.

Stähli makes a summary of fifty cases of microcornea with the following conclusions:

1. An overwhelming majority of eyes with microcornea must be classed as normal eyes, as the central vision in most cases is normal.

2. The diameter of normal corneas varies within wide limits, but the extremes are very rarely seen.

3. In the majority of examined eyes the radius of the cornea is from small to very small, and the corneal refraction high to very high.

4. In spite of the high refraction of the corneas in these cases the eyes are nearly always hypermetropic, so that the resulting total refraction is less.

5. Priestley Smith's conclusions

that the microcorneal eye is disposed toward glaucoma are supported. Nearly 20 percent of the people with microcornea who came to the clinic were suffering from glaucoma.

Ford reported a case of congenital pigmentation of the cornea, the pigment appearing in vertical lines.

Corneal Repair.—Spicer contributes a very interesting paper on the formation of clear spaces in corneal nebulae. Although such spaces have been long known, they have been described by very few observers. The author reviews the previous papers on the subject, quoting Fuchs, Frost and Stephenson.

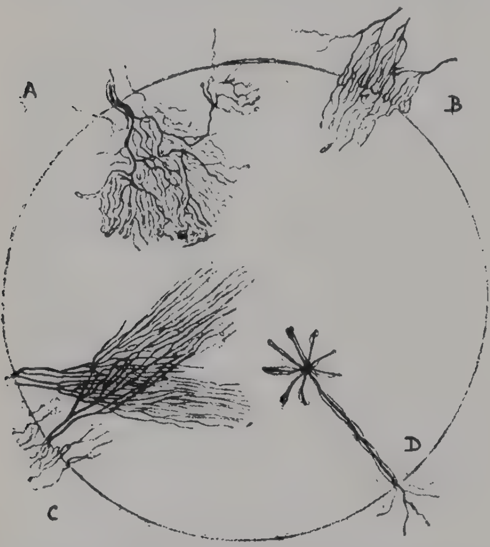

Fig. 10. Types of vessels in the cornea. A arborescent type. B terminal loop type. C brush or besom type. D umbel type. (Holmes Spicer.)

Since the changes observed are dependent on the presence of blood vessels, he classifies the various types of vessels which are seen in the cornea into four general groups: arborescent form, terminal loop, brush or besom form, and umbel form. He states that it is uncommon for vessels to disappear and leave no trace. Even when they contain no blood they may be seen as fine, silky threads lying on or near the surface, or as clear lines beneath the surface. Vessels keep to their own level or layer of the cornea, and their branches do not commonly anastomose with those of a different layer. An exception to this last observation is found in interstitial inflammation where vessels may penetrate and communicate with those lying in other layers.

The clear lines in the cornea are divided in two kinds—the geometric group and the mushroom cap or coral reef. The geometric lines are clear spaces in which no trace of haze, opacity, or structure can be seen, and lie in the midst of nebulae. These clear lines are perfectly straight, or run in large, smooth curves. They are so perfectly straight and sharply cut that they appear like machine-ruled geometrical figures. They are often very much broader than any possible vessel. Sometimes they may be traced to the limbus, but often are seen only in the center of the cornea. They are best seen against the pupil as a background, the pupil being dilated with a mydriatic and viewed with oblique illumination.

The writer thinks there is no doubt that they have as their basis the tracks of old vessels. As an explanation of the phenomenon, the author states that "at a certain depth within the layers of the cornea a tuft of brush vessels makes its way; at the end of the attack the vessels shrink and lose their blood, but remain as potential channels. These channels become greatly flattened from compression in the layers of the cornea during and after subsidence of inflammation, and owing to this they have a much greater width than when they contain blood. The result of the stretching is to straighten the course of the vessel, to remove inequalities and deviations, and to give it the geometric quality of a straight line." The conditions which are most likely to produce these lines are interstitial keratitis, which cause little or no change in the endothelium. Of twenty-five cases of geometric lines investigated, in six there had been interstitial keratitis; two cases, ulcers and interstitial keratitis; in two others, probably interstitial keratitis. In two there had been an injury; in eleven there had been ulcerations of various kinds. In four there was no evidence of the cause.

In the mushroom cap group the stalk is of a delicate blue-gray, in which vestige of vessels can often be made out. These do not extend as far as the head of the mushroom. The head of the mushroom is crescentic in shape, densest on its concave edge, fading away on its convex. The concave edge is usually fringed like the gills of the mushroom. The head contains neither blood vessels nor remains of them. The head is of a different color from the stalk, having a dirty white or buff color in contrast to the cool gray. The author states that there can be little doubt as to the nature of these mushroom heads. They are not scars of ulcers themselves. They are different in color from primary nebulae; they appear a certain time after an ulcer has come to an end, the shortest time being nine months. They are regarded as secondary to ulcerations which have been attended by invasion of the cornea by blood vessels; they appear specially to follow the fascicular or leash ulcer, but remain isolated from it by spaces of clear cornea. The mushroom head is also seen after attacks of scleritis in which the cornea has not taken part.

The first necessity for the formation of all these secondary opacities is destruction of tissue attended by ingrowth of blood vessels. Attention is called to the resemblance between these opacities and arcus senilis; arcus is more likely to occur in eyes which have had corneal ulceration. "The clear space between the outer edge of the arcus and the scleral edge is analogous to the clear space between the concave edge of the cap and the end of the leash of vessels."

Neuropathic Keratitis.—Fusihira reports a case of keratitis neuroparalytica after a kick from the hoof of an animal in a soldier who had trigeminal and facial paralysis, and in one eye anesthesia of the cornea and conjunctival dryness. After two months the disease was healed, but not before ulcer of the cornea had occurred, which the author thinks was due to injury of the trophic nerve.

Soria has written on neuroparalytic keratitis.

Superficial Punctate Keratitis.—Goldenburg presented a case of superficial punctate keratitis in a girl aged 25 which has been under his observation for over two years. Many small grayish elevations 1 or 2 mm. in diameter were scattered over the cornea. While under observation these elevations would recur in crops attended with pain, and disappear in five or ten days, leaving behind little grayish dots which in turn would completely disappear, leaving no sign. At times recurrence would take place before the previous crops had entirely cleared up. At times the elevations were very numerous, and at others only four or five would be visible, appearing in one eye alternately, or both simultaneously. Every clinical examination and laboratory test was made and found negative. No treatment was found which had any distinct influence or value.

Masuda has written on the pathology of diffuse superficial keratitis.

Rosacea Keratitis.—A patient of **Griscom** had complained of sore eyes for eight months. She was aged 47 years, a heavy eater, and suffered from chronic constipation, and for two years had suffered from acne rosacea involving nose, chin and cheek appearing at the menapause. On the cornea near the limbus were several areas of superficial infiltration about 2 mm. in diameter. There was a band of superficial blood vessels running from the limbus on both nasal and temporal sides. The remainder of the cornea was clear. **Uribe-Troncoso** reports acne rosacea complicated by fasicular keratitis in a patient aged 44 years.

Herpes of Cornea.—Sidler-Huguenin is of the opinion that herpes of the cornea is never of traumatic origin. He believes herpes of the cornea to be an endogenous affection, and that some persons have a predisposition to the disease. The treatment recommended is rest in bed, a tight bandage and moist heat until the lesion is well. The prognosis is good provided secondary infection does not occur.

Gamper, in his paper on the traumatic etiology of febrile herpes cornea traumatica, concludes that this is an extremely rare occurrence. A traumatic etiology can only be recognized when there is a clear and close connection between trauma and the onset of the disease and other etiologies are absolutely excluded. Until the present time a diagnosis of traumatic febrile herpes cornea could not be made with scientific certainty, because (1) the literature does not show any cases in which there is an absolutely clear connection between traumatic febrile herpes cornea and a simple trauma; (2) hitherto this disease picture could not be produced experimentally; and (3) there had never been a case of simple trauma which was followed by febrile herpes cornea. **Eppenstein** also writes on traumatic etiology of herpes cornea.

Gallemaerts describes a case of zona ophthalmica in a child of five years. Necrotic plaques were found on the upper left half of the face extending into the scalp as far as the parietal region. The nose was free. There was a large central corneal ulcer with much conjunctival secretion. The child did not complain and played with its friends. **Isakowitz** writes on the treatment of corneal herpes.

Disciform Keratitis.—Verhoeff reports a case of keratitis profunda or disciformis—a man aged 65, whose eye was enucleated eleven weeks after the onset of keratitis. Bacteriologic examination of sections stained by the Gram method and in carbolthionin show no microorganisms in the cornea or elsewhere. The author reviews the various causes of keratitis disciformis, showing that it may be due to hereditary syphilis; that it may occur as a type of ulcus serpens; that it may result from infection with vaccine virus; that it may occur in non-gonorrheal ophthalmia neonatorum due to infection with the streptococcus mycosus; that it may occur as a form of tuberculosis, and as a result of unknown infections. Also, it may occur as a complication of herpes cornea, or as a result of trauma. In the latter cases it is probably neuropathic in origin. Therefore, from an etiologic standpoint disciform keratitis is not an entity. From the microscopical findings, the author thinks that it is obvious that the central corneal lesion in the case reported is due to some diffusible toxic substances arising near the anterior surface of the cornea, and that the microscopic findings strongly indicate a neuropathic origin for keratitis profunda.

Kuboki describes anatomic changes in keratitis disciformis. The author had an opportunity to examine histologically a case. The disease was in the inner and lower quadrant of the cornea and showed in the center two concentric ring-like opacities. Histologic examination of a freshly cut portion showed the opacity was due to cell infiltration which occurred in the outer and middle layer of the parenchyma. Bowman's membrane was partly defective. The epithelial layer of the inner basal cells was irregular. The more lightly affected portions between the rings showed cell infiltration due to edema, necrosis and fatty degeneration. The infiltration was due to round cells, eosinophiles and plasma cells.

Nishimura reports a case of keratitis disciformis in an 18-year-old girl. In this case the hay bacillus was found and the same form of corneal lesion was produced experimentally in the cornea of a rabbit.

Ring Infiltration of Cornea.—Giri reports a case of ring infiltration of the cornea in purpura and discusses its pathologic genesis. He reviews and discusses twenty cases which have been previously reported. Eleven of these followed accidental wounds of the cornea; four occurred after cataract extraction; five in the course of metastatic ophthalmia. In the metastatic cases one was suffering from complicated fracture of the femur, one from suppurative cystitis, one from cryptogenetic pyemia after cholelithiasis. Two were in women suffering from puerperal septicemia.

Giri's case was in a boy 13 years of age, being the youngest reported. This was associated with Henoch's purpura, and is the only case reported associated with acute general infection. The purpura was characterized by lesions in the skin, swelling of one elbow and gastro-intestinal disturbances. There was no localized focus of sepsis discoverable elsewhere. There was no history of scarlet fever or rheumatic fever. Heart, kidneys and teeth were normal. The author believes that the infection of the eye was a local manifestation of general diseases of the blood.

The annular infiltration was characterized by the rapidity of its formation, a complete, well-formed ring having occurred within forty-eight hours after the first manifestation of ocular symptoms. The eye did not go on to panophthalnitis, but became soft and shrunken. One month after the onset of symptoms the eye was enucleated. The author believes the phenomenon of ring infiltration to be essentially a ring of infiltration, neither to the wound nor to the necrotic cornea, but to the toxin-pervaded area of the cornea. The phenomenon is observed only in cases of marked virulence of the infection, or low vitality of the organism, or both.

Herbert reports a case of ring infiltration of the cornea in plague, making the second case of this phenomenon due to acute general infection. The author believes that the condition is not rare in septicemic plague. The case mentioned involved both corneas. The patient died on the seventeenth day. There was no evidence of suppuration elsewhere.

Mayou reported a case of purulent ring infiltration of the cornea following "mustard gas" in a soldier 33 years of age, the lesion being the same and involving both corneas. The surface epithelium was roughened, but intact. In the superficial layers, about 2 mm. from the margin, there was a yellowish band of purulent infiltration. The margin toward the center was sharply defined and the cornea clear beyond it. The outer margin was ill defined and shaded gradually into the surrounding cornea, which was practically clear at its margin.

Pichler reports a case of Caspar's ring opacity of the cornea.

Meller contributes a paper on ring opacity of the cornea following injury, presenting the case of a soldier who developed annular opacities after an explosion. The corneal opacity was eccentric 6 mm. in diameter. Corneal sensibility was normal. Visual acuity was 6/9. Of the etiology he is not absolutely certain. He thinks it may be sometimes confused with disciform keratitis. In this case the lesion followed contusion which no doubt brought about the condition of ring opacity. **Meller** also writes on "band-like" opacities of the cornea.

Freytag writes on transitory corneal opacity from cold. A soldier 38 years old presented this trouble in the left cornea without any ocular reaction, with a visual acuity of 5/18, after a rest of two hours in a temperature of 3 degrees C. The habitual vision was 6/8. **Wessely** has contributed a paper on corneal disturbances due to cold.

Keratitis Due to Melinite.—Perrin has followed 32 cases of this condition from their entrance into the hospital until their cure. The characteristic features are a corneal opacity usually triangular in shape, negative bacteriologic findings and complete cure in 6 to 9 weeks. The keratitis is diffuse and subepithelial. Descemet's membrane never seems involved, nor is the corneal epithelium affected. A characteristic subjective symptom is the presence of a halo or rainbow of three colors, the green color being central, then the yellow, and most peripherally the red. But in no patient was there a hypertension. The main point in the treatment is to remove the patient from exposure to fumes of melanite. Other treatment, yellow oxide of mercury ointment, collyrium, methylene blue and bathing with sodium borate.

Rössler observed corneal changes in the eye of a man who had been wounded by shrapnel. The shrapnel entered above the right malar bone and came out on the temporal end of the left eyebrow. The conjunctiva and lids of both eyes were injected and swollen. There was present Vossius ring. The author explains the corneal changes as neuropathic.

Corneal Ulcers.—Lowenstein writes

a histologic report on two cases of staphylococci ulcers of the posterior surface of the cornea.

Dulaney reports his observations on a number of cases of keratitis associated with influenza. No specific organism was found. The organisms most frequently found were the streptococcus, pneumococcus, staphylococcus, micrococcus catarrhalis, and bacillus of influenza. The lesions seen had no definite diagnostic characteristic.

Serpiginous Ulcer.—Nance reviews the etiology of serpiginous ulcer and then discusses the treatment in detail. He emphasizes two points in the treatment. The first is to check the extension of the ulcer by the destruction of the invading micro-organism. The second is to bring about the reduction of the increased tension, which the author believes is almost always present in these cases. Repeated paracentesis of the anterior chamber in his experience has often brought about favorable results when other forms of treatment have failed. The writer emphasizes the fact that cases with increased tension do not respond to treatment. The method of heat employed is that of holding a cautery point as close to the corneal ulcer as possible without actually touching it. The association between serpiginous ulcer and lacrimal disease is emphasized.

Kearney, following the endeavors of Roemer as an earnest advocate of the use of serum treatment for ulcers of pneumococcal origin, believes that by this method cauterization, which so often becomes imperative in this class of cases, will in a large number of cases be found to be unnecessary. With this treatment there is always less hypopyon, and seldom is it found necessary to do a corneal section. He reports a case in which 50 c. cm. of pneumococcus serum of mixed stock was injected into the back muscles, being repeated again in 24 hours. Following the injections the intense ocular pain disappeared, and the second day following, the marginal infiltrate gradually disappeared. Only a slight haze in the corneal tissue remained after the active symptoms disappeared.

Hayashi reports that in 80,194 eye cases serpent ulcer occurred in 0.26 percent. The half (52½ percent) had suppuration of the tear sac. The author injects tincture of iodin reduced to 20 percent, and finds that the suppuration ceases. For the ulceration he uses 25 percent sulphate of zinc.

In a case of pseudomembranous keratitis due to the pneumococcus, **Dutheil** saw almost complete destruction of both corneas. **Pindikowski** has reported a case of early lagophthalmos keratitis with microscopic examination of tissues. **Andrew** has written on facial paralysis and corneal ulcers.

Guibert writes on the treatment of corneal ulcers in general, as also does **Leoz Ortin. Aziz el Aguizy** treats infected corneal ulcers with subconjunctival injections of mercuric chlorid, and in ulcers caused by other infective microbes he aims to use a treatment which kills the microbe without affecting the corneal substance, and if this is not possible he tries to stimulate the natural defences of the body. He reviews the methods of different authors, and describes his method of subconjunctival injections as follows: A 2 percent solution of cocain is dropped in the eye three or four times, then from 5 to 10 minims of sublimate solution 1 in 2,000 are injected beneath the conjunctiva as near the ulcer as possible. This is generally followed by edema, which disappears. In severe cases the disease was cured in from 8 to 21 days.

In the treatment of serpiginous ulcer of the cornea **Augstein** advocates the use of chemotherapy. **Alvarez Revero** employs ethylhydrocuprein, and **Bentzen** and **Rosenhauch** also recommend the use of optochin in serpent ulcer.

Paradies differentiates between the action of optochin on the pneumococci and its action on staphylococci. He also gives a course of treatment to be followed out. **Wolffberg** summarizes current opinion with regard to the causes and therapy of recurring corneal ulcer.

Bluhm treated 55 cases with optochin therapy only. Forty-five of the cases recovered. The end results were no better than with the older recognized treatment of serpent ulcer. Optochin seemed at first to have a limiting effect on the ulcer, but later the ulcer was likely to deepen quickly, and a perforation was extremely likely. Five cases came to perforation in spite of optochin treatment. The injuries were of 6 to 14 days' standing before they came for treatment.

Thermotherapy of Corneal Ulcers.—Weekers reviews his previous articles, describes his method of sterilization of corneal ulcers, and presents his experimental demonstrations of the action of heat on corneal tissue. In a former publication he showed that the cultures of pneumococci are sterilized in 24 hours at a temperature of 108° F.; in 10 minutes at 138° F., and instantly at a temperature of 149° F. to 158° F.; that the cultures of the Morax-Axenfeld bacillus are killed in 5 minutes at a temperature of 131° F.

The author believes the efficacy of thermotherapy to be remarkable. He uses the loop of the electric cautery at a temperature of 122° F. as near to the corneal ulcer as possible, continuing the application one minute. This is repeated two or three times at one sitting. He believes that a single treatment is usually sufficient. Experiments with rabbit's cornea show that from his method of application the corneal lesions are simply epithelial swelling, and a slight edema of the layers of the corneal parenchyma immediately beneath. There is no true corneal tissue destroyed. The parenchyma preserves completely its thickness and strength.

Jackson shows that heat has been used in nearly every conceivable form in the treatment of corneal ulcers, except that live steam and boiling alcohol seemed not to have been used. The author states that to check a corneal infection it is not necessary to boil or char the organisms. It is only essential to raise them to such a temperature as will destroy their power of multiplication; and the temperature that will effect this is one that will not do any great damage to the cornea itself. **Langdon** reported a case of hypopyon ulcer of the cornea treated successfully by chauffage.

Hypopyon.—Moore discusses hypopyon and reports the use of a 1/1000 cyanide of mercury solution, ten minims being deeply injected in the intraorbital tissue, which was followed by a complete absorption of the hypopyon in three weeks. Many other forms of treatment had been tried previously and had failed. These included atropin, dionin, chemical cautery, cyanide 1/20,000 subconjunctivally, pasteurization, and actual cautery. Final vision in the eye thus treated was 20/30.

Gifford has found a very efficient method of treatment for severe corneal ulcers in the form of a "delimiting keratotomy." The author makes the incision or incisions after the classic Guthrie-Saemisch incision, but always making them tangent to the ulcer without quite touching it. The author has found that such incisions will limit the spread of the infection, which gives time for the direct treatment to the ulcer proper. Keratotomy has been most frequently used in hypopyon keratitis, but is regarded by the author as equally useful in any form of rapidly spreading ulcer.

Hazen calls the attention of the profession to the deleterious effects of cocain in the treatment of various forms of keratitis.

Axenfeld reports hypopyon keratitis from the bacillus pyocyaneus.

In the treatment of hypopyon keratitis **Ourgaud** concludes that under treatment with iodin, after scraping off the epithelium, repair takes place in three or four days, and this treatment does not increase the density of the future leucoma. **Dubois** treats hypopyon ulcer with optochin.

Keratomalacia. — Rönne deprecates the usual grave pessimistic prognosis of keratomalacia as found in most text books of ophthalmology. He contends that a timely diagnosis and appropriate treatment offer prospect of recovery. He believes that xerosis is almost wholly a dietetic disorder. The author believes that the real cause of the disease is a lack of milk, or some substance contained in milk, as evidenced by the almost complete freedom from the malady in milk-fed children; and, further, the miraculous recoveries, not only to the eye, but to the general health, which follow when milk is given in sufficient quantity. The treatment naturally consists in feeding the child with as large a quantity of unadulterated raw milk as it can take.

Necrosis of Cornea.—**Hegner** describes a case of severe necrosis of the cornea due to salvarsan poisoning in a patient 45 years old infected with syphilis twenty years prior, who received two injections of neosalvarsan. This was followed by swelling of the right arm and redness of skin of the whole body. The skin affection soon cleared, but swelling of the arm was obstinate. The patient was suffering from cerebro-spinal syphilis. Wassermann reaction was positive. A third injection of neosalvarsan was followed by redness of the whole body, rising temperature and symptoms of pneumonia. The eyelids became swollen, and ulcers appeared on each cornea, and the entire cornea ultimately sloughed. The patient died of pneumonia. There developed several ulcers of the skin and generalized salvarsan dermatitis. The postmortem findings are described, and the diagnosis of salvarsan poisoning confirmed as correct.

Antityphoid Vaccine Keratitis.—Recent medical literature records many cases of local and systemic disease following antityphoid vaccine. The eye is not immune. **Bell** reports a case of keratitis profunda involving both eyes following inoculation with antityphoid vaccine. In this case, syphilis, tuberculosis, teeth and tonsils were positively eliminated as causative factors. The patient was a man 24 years of age. No untoward symptoms followed the first injection. Following the second injection a week later, he suffered chill, headache, malaise, a rise of temperature, together with ocular symptoms, photophobia, pain and swollen lids, and developed a typical deep keratitis in both eyes. Bell regards his case as one of typical anaphylaxis, bacterial in origin. The first injection sensitized the cornea, and the second acted as an anaphylactic dose.

Bussy of Lyon, France, who had charge of the ophthalmic service where 22,000 troops were vaccinated against typhoid, reports that five men developed ocular lesions. Three of these cases developed herpes and ulceration of the cornea.

Pacheco Luna reports a case of ocular lesion following antityphoid vaccination and reviews previously reported cases. His patient was a German, 52 years of age. Two doses were given without symptoms. The third dose, 1 cc. of Mulford's "Typho-Bacterin Mixed," was followed by fever, headache, boneache, general malaise, chill and nasolabial herpes on the right half of the face. The following day eye symptoms appeared. On the sixth day there was a well-developed but superficial branching ulcer of the cornea. The cornea was anesthetic. No area of focal infection was found. The case was diagnosed as herpes febrilis of the cornea. Three years prior to this attack the patient had had keratitis and ulceration. The author concludes that there exists no ocular lesion depending directly and exclusively on the antityphoid vaccine. He states that it is not prudent to vaccinate luetic, tubercular or rheumatic subjects who have previously had lesions of the uveal tract.

Parenchymatous Keratitis.—**Brav** reviews the "Variations in the Clinical Picture of Interstitial Keratitis," showing that there are many variations in the symptoms, course and ultimate outcome of the disease which depend largely on the nature and virulence of the infection and the individual susceptibility of the patient. The author believes that interstitial keratitis is always the result of hereditary syphilis.

McDannald presented one of twins, a child with interstitial keratitis, who had been under observation for several years. The interesting feature in the case was that the child's mother and the child itself had positive Wassermann reactions, while the father and the other twin have been both clinically and serologically free from any sign of syphilis.

Akazaki studied the Wassermann reaction of patients with parenchymatous keratitis in the same family. In the 25 children examined, 13 were positive and 12 negative. He shows that the Wassermann reaction often fails in congenital syphilis. Deep pustule and exudates in the cornea are reported by **Meller**. They cleared up under antisyphilitic treatment.

Imai has written on the etiology of parenchymatous keratitis. **Laveran** calls attention to the great frequency of keratitis in dogs inoculated with trypanosomes. **Buxton** has written on dumb bell keratitis and **Kirkpatrick** and **Lauber** upon corneal inflammations.

Corneal Tuberculosis.—Clapp presented a case of interstitial keratitis, and brought out the fact that some cases of interstitial keratitis which do not improve under specific treatment are probably associated with tubercular infection. This patient has been under treatment for many months with specific treatment, without improvement. The von Pirquet reaction was positive and the eyes have improved much more rapidly since the giving of tuberculin. **Hoeg** has written on tuberculous parenchymatous keratitis treated with tuberculin. **Koeppe** has cured corneal tuberculosis with tuberculin injections. **Bane** reports a case of corneal and uveal tuberculosis in which the tension of the left eye was found at first to be 28 mm., and later remained above 52 mm.

Chen Hung Hsun examined bacteriologically 100 cases of phlyctenular kerato-conjunctivitis. The majority of cases were infants, but there were individuals of 20 to 30 years who were generally otherwise in good health.

Leprosy.—Weeks reports a case of maculo-anaesthetic leprosy of brow and cornea in a Russian male, 30 years old. The lepra bacillus was recovered from the nasal secretion.

Nodular Keratitis.—Mayou reports a case of corneal degeneration. The change in the cornea was essentially of the macular and nodular type situated in the interstitial substance of the cornea. The opacities were densest around the margin where there were changes which looked calcareous in character. About 2 mm. inside the corneal margin there was a brown ring of pigment. Inside this ring the opacities gradually grew less dense, changes being similar in both eyes. The vision was only slightly reduced.

Bell reports two cases of nodular keratitis in a woman aged 50 and in her daughter, aged 16. The woman had progressive deterioration of sight without pain or inflammation. Both patients were in good general health. It was considered by the author as a family degeneration of the cornea. There was no anesthesia in the cornea in either case. Wassermann was negative in both cases. The author regards the etiology as some form of toxemia. **McCaw** reports a case of nodular keratitis in a woman aged 43 years.

Uhthoff gives the anatomic and clinical researches of degeneration of the cornea (Groenouw). He found fissure of Bowman's membrane, proliferation of the cells; and that granular protoplasmic masses occupied the place of the destroyed basal cells. The anatomic examination showed grayish degeneration. He thinks the affection rare, finding little in the literature similar. The lesion is subepithelial and penetrates the deeper structures of the cornea.

Groenouw has compiled a very complete bibliography of family hereditary nodular opacities of the cornea through three generations, five members in one family presenting central opacity of the cornea, measuring 2 mm. in diameter (maximum).

Haab has again contributed to the literature of "alphabet keratitis" (O. Y. B., v. 2, p. 83). **von Szily** writes on epithelial striped disease of the cornea from a neurologic standpoint, and **Pascheff** contributes a well-illustrated paper on band-like formation in traumatic keratitis, and attributes it to rupture of Bowman's membrane.

Corneal Opacities.—A case of the congenital opacity of the cornea spoken of as "blue corneas" was seen by **Dabney** shortly after birth. The child was not delivered with forceps, and there was no evidence of any undue contusion of the cornea. In two months' time the blueness entirely disappeared in one eye, not completely in the other. The cornea of the worse eye appeared slightly staphylomatous.

Giri reports a case of bilateral superficial symmetrical opacity of the cornea of unknown origin.

Schoute treated a 5-year-old girl who suffered from zonular corneal opacity. Three years previously she had had vulvovaginitis of gonococcic origin with inflammation of the knee joints, but had since been healthy. No tuberculosis or lues demonstrated. The author decided that she was suffering from a metastatic gonococcal infection and had her treated accordingly, but with no decided improvement. He turned the patient over to Dr. Snellen, who decided that the opacity arose from a disturbance of circulation due to the heightened tension, or stretching of the cornea arising from the inflammation of Descemet's membrane, such as is seen in old persons. He prescribed pilocarpin and scopolamin. The eyes improved. There was no further extension of the inflammation. Final vision was R = 6/10, L = 1/100.

Four cases of "band-like opacity" of the cornea occurring in children are reported by **Fuchs**. Three of the four had previously suffered from inflammation and swelling of the joints, particularly the knees. One certainly and another probably had hereditary syphilis. The eyes had become attacked at from 18 months to 7 years of age. The opacities were somewhat atypical, but properly classed as band-like. Fuchs points out that such opacity is rare in childhood, but appears to come on more rapidly than in old people, and in his cases coexisted with some vision which improved greatly in two of them.

Subepithelial clouding of the cornea arranged in definite lines and following injury is reported by **Caspar.** His eight cases are divided into two equal groups. In one the form of the opacity was line approximately straight, in the other the line was nearly circular.

A case was presented by **Chance** in which a woman of 68 had noticed for about a year a spot on the lower part of her left cornea. It was elliptical, 4 by 6 mm., yellow, resembling old ivory, lay beneath the epithelium and was distinctly marked off from the healthy cornea adjoining it. At its center the epithelium had been eroded by an eyelash on the lower lid. At this point there was some fine blood vessels; elsewhere it was nonvascular. He regarded it as a fatty degeneration of the cornea caused by prolonged irritation.

For leucoma nonadherent, **Guiral** recommends tattooing by the injection of the emulsion of India ink into the substance of the cornea through a fine needle. This much be introduced about 1 cm. with great care not to perforate either the external or internal surface. He gives photographs of the case showing very complete concealment of a leucoma.

Theobald brings out a practical point in the operation of corneal tattooing. He advises the scarification of the area to be tattooed first and then the rubbing in of the ink. In this way the operator can be sure of the area which he desires to color. **Rothschild** has experimented on animals' eyes with corneal tattooing.

Lindgren has written on the treatment of proliferating maculae corneae by conjunctival transplants. **Oesterreicher** reports a cyst formation after Kuhnt's conjunctival keratoplasty.

Krämer presented a patient who came to him complaining of chronic lid and conjunctival inflammation. Upon using the Priestley lamp there was noticed on the light brown iris a dark spot, which at first was located at the nevus, but with movement of the lamp the spot moved to different positions. The appearance was explained by the presence of a small pit in the cornea with absolutely no opacity, which scattered the light, so that the part of the iris in this shadow appeared darker.

Blood Staining of Cornea.—Maghy gives a report of his observations on blood staining of the cornea and the microscopic findings in three eyes which required enucleation. He reviews the literature on the subject. He concludes that the highly refractile bodies seen in the corneal stroma in cases of bloodstaining of the cornea are pigment granules transformed from hemoglobin; that hemoglobin gains access to the cornea by diffusion through Descemet's membrane; that the discoloration is due principally to the pigment granules, although blood corpuscles may be associated; that the degree of the discoloration varies according to whether hemosiderin or other hemoglobin derivatives are present; that the staining never affects the extreme periphery on account of the efficient lymph circulation at the limbus, nor are there pigment granules in this area; and that the presence of an iron reaction seems to depend on the vascularization of the tissue.

Wernicke has contributed a paper on bloody infiltration in the cornea.

Megalocornea.—The increased size and spheric form of the cornea is very frequently seen in hydrophthalmos, and closely associated with glaucoma. But in several of the cases reported by **Soriano** the tension of the eyes was normal or below normal. Patients thus affected are likely to retain sight throughout life. One of his patients was 57 years old; another was 39. **Seefelder's** patient, aged 19, had vision of 6/12 and 6/6 with correction for compound myopic astigmatism. The tension was only 18 mm.

Marginal Dystrophy of Cornea.—A case of this kind was reported by **Marquez.** The resulting acquired astigmatism was 12 to 13 diopters, and the best vision obtainable with lenses was 0.5.

Keratoconus.—The favorable results obtained by Wiener by means of surgical procedure in the treatment of keratoconus led **Fox** to adopt surgery for the relief of this condition. His operation consists in the removal of a semilunar strip of cornea, 2 to 3 mm. wide in its widest portion and 5 to 7 mm. long, which involves the entire thickness of the cornea, the strip being removed from the area above the horizontal axis. An iridectomy is performed. The stitches are placed just beyond the pupillary margin. Margins of the wound are brought together by fine silk sutures passing through the entire corneal tissue. The result of the operation is to flatten the cone, which does not again regain its conical shape. The results obtained in ten cases have been very satisfactory. In one case vision of 3/200 was brought to 20/30. The average vision with correction was 20/70. In the discussion of this paper Lancaster stated that in private practice he found that patients with keratoconus were exceptionally well nourished. In his experience ocular rest has often checked the progress of the disease, and in some cases actual improvement has followed.

Uhthoff contributes a paper dealing with the clinical and anatomical studies of keratoconus in two eyes enucleated because of intolerable pain. The cornea and globe appeared normal externally but on close examination the cornea of one globe was found much thinner at the periphery. There was some infiltration and hyalin degeneration. In the second the cornea was also preserved, but it was very thin at the center with ectasia. In neither of the two cases was there any pigment ring infiltration. Bowman's membrane was greatly expanded—almost to disappearance—and Descemet's membrane was also distended.

Kraupa, in a controversial paper, states that "the hemosiderin ring is practically a constant feature in keratoconus." He is inclined to accept the inflammatory genesis of the ring, as against **Fleischer,** who is not of this opinion. He, however, states that this is a much-mooted question, only to be finally decided by further observations and experiments, and quotes J. Schnabel: "Our whole knowledge is derived from deeds, from observations, and the only source of new knowledge lies in the description of new observations."

Siegrist continues his studies of this affection since 1913, and thinks he has established a relation between keratoconus and alterations in the glands of internal secretion, the thyroid, thymus, ovarian, etc. He reviews all of his former work, and also that of Sulzer and Müller. Siegrist himself uses the galvanocautery freely. An optical iridectomy and corneal tattooing give a good cosmetic effect.

Salmon reports two cases of keratoconus treated by the use of the high-frequency spark, which at first produced very favorable results, but which were not permanent, at least in the second case. The author states that all cases of conical cornea show a decreased tension.

Weill comments on the various German innovations for the correction of keratoconus, with especial reference to the contact glasses now manufactured by Müller and Zeiss. These are in the form of a shallow protesis designed to be slipped into the conjunctival sac, with an area of clear glass over the cornea. They can be easily inserted with the aid of a normal salt solution. The Zeiss contact glass gives a very great improvement in vision, but can be worn only a few hours without signs of irritation. The Müller glass does not give as great a correction of vision, but can be worn constantly during the working hours. **Eperon** and **Erggelet** each contribute papers on the correction of keratoconus.

Crisp reported a case of traumatic conical cornea in a boy aged 12. The morning following the injury it was noticeable that the whole depth of the cornea was bulging considerably in the form of a flattened cone. The tension of the eye was slightly subnormal.

Corneal Transplantation. — Müller had a male patient who had absolute glaucoma in the left eye with a clear cornea, and in the right eye a leukoma with normal tension. After extirpating the leukoma and the clear cornea, he transferred the leukoma to the glaucomatous eye, and the clear cornea to the eye with normal tension. The grafts were held in place with two stitches taken in the conjunctiva and a conjunctival flap. Both healed uneventfully, but later the glaucomatous eye had to be enucleated. Although there is a thick white ring at the site of uniting, the remaining eye has an area of clear cornea through which the man has vision 3/36. He is able to go about alone and to read headlines in the newspaper. The original graft was 3 mm. across, but is now only 2½ mm.

Kuhnt describes the closure of a defect of the cornea by transference of the fascia lata. The eye, after being wounded, developed perforating abscesses of the cornea, causing a large perforation and prolapse of the iris which was later cut out of the wound. Cutting away of the prolapse and a kerato-plastic flap of the conjunctiva did not help to prevent the further enlargement of the hole, nor did a broad peripheral iridectomy help. Transplantation of the fascia lata, simultaneous corneoscleral trepanation and the covering of it with conjunctiva brought the staphylomatous processes to an end. Kuhnt names three conditions as being necessary for the successful consummation of the operation: 1. The cutting away of the diseased portions of the wound edges. 2. The control of the intraocular pressure. 3. The successful fixing of the fascia lata to the wound by stitches taken in the scleral conjunctiva.

The cartilage found in the sclera of the chicken has been the subject of a study by **Ochi.**

THE SCLERA.

Scleritis. — **Miller** reports a case of scleritis and episcleritis which was accompanied with very severe pain. Under atropin, locally, and the internal use of salicylate of soda, there was some relief. This was followed twelve days later by another attack. The author treated the inflamed area by dissecting freely the conjunctiva and episcleral tissue and by transfixing the elevated area by means of a fine cutting instrument. Following this treatment the discoloration disappeared after five days, and the operation gave instant relief from pain. Miller considers scleritis as a local manifestation of constitutional absorption of toxins. **Szymanowski** has written on the pathology of scleritis. A serous cyst of the sclera, 1 mm. in diameter, was observed by **Menacho** in an eye that had suffered from severe keratitis.

Blue Scleras.—In 1916 **Voorhoeve** examined a father and two daughters in all of whom he found brittle bones and blue sclerotics, and in the father alone hemophilia. The author puts forward an interesting hypothesis that in these cases of blue sclerotics we are dealing with an hereditary inferiority of the mesenchyme. The author obtained information concerning 244 members of this family, extending over five generations. Consanguinity did not occur, neither was there any trace of lues. The author personally examined forty members of this family. Of these, seven had blue sclerotics, three brittle bones, four hemophilia, one cleft palate, one rickets. All the above abnormalities are related to the mesenchyme organs, which fact the author regards as strongly supporting his hypothesis of an hereditary inferiority of the mesenchyme. Four patients in this family were found to have labyrinthin deafness.

Cassimatis has reported the case of a man, aged 31, and his son, aged 2½, and his daughter, 6 months, all affected with congenital blue scleras. Otherwise they were in perfect health. No other cases were known in the family, but the wife of the man was a niece.

Pigmentation.—**Zentmayer** reports a case of congenital pigmentation of the sclera in a Russian Jewess, 18 years of age. Each eye presented a broad interrupted zone of pigmented sclera, reaching within a few millimeters of the cornea, and extending almost to the equator of the globe. The pigment appeared in blotches and varied from light to dark slaty gray, and in places brownish. The brownish color was lost by the instillation of adrenalin, showing the brownish color was probably due to the presence of capillaries. The skin of the lids was dusky and the veins dilated and dark. The skin of the face showed linear pigment stripes. There were disseminated areas of "port wine" nevus over the entire body, with the exception of the right arm and foot. The patient was the oldest of five children. No other was similarly affected. She had good teeth and had broken no bones. The condition was considered a pigmented nevus of the sclerotics.

Tuberculosis.—**Knapp** presented two specimens of intraocular disease with anterior scleral ectasia. The author regards inflammatory conditions of the eyeball with ectasias in the anterior part of the sclera as always serious. His first case was that of a colored woman, aged 48. The eye presented symptoms of severe iridochoroiditis. Later there developed a marked swelling of the sclera. Tension was increased, inflammatory symptoms pronounced and eye painful. The eyeball was enucleated. The microscopic examination of sections revealed a tubercular process. Second case, man, aged 23. A prior detachment of the retina was followed by an inflamed, painful eye with well-marked ciliary congestion and a pronounced scleral nodule over the site of the internal rectus muscle. Light perception only; Wassermann negative. Tuberculin test gave marked arm reaction. Eyeball was enucleated, and a well-marked sarcoma of the choroid was found.

Scleral Thinning.—**Guist** showed a case of scleral thinning with necrosis.

and staphyloma in both eyes of a woman 69 years of age who had arthritis deformans. The condition first showed at the time of the climacteric, and had progressed to staphyloma. In 1906 she came to the clinic because of trachoma; in 1911 the blue sclera appeared, and in 1916 there was a staphyloma the size of a bean. The media are normal, tension normal, tuberculin and Wassermann test negative. X-ray shows an atrophy of the bones with secondary stratifications. Ophthalmoscopic examination showed normal choroid except in the immediate vicinity of the staphyloma. Microscopic findings show calcium in the center. No uric acid. Under the epithelium is a tenacious connective tissue, then a thick capsulated layer, and on the inner surface of this, more connective tissue. Here are found numerous giant cells, the tissue is partly necrotic and there is degenerated scleral tissue without cells. In the literature are only two other cases — Andra's case and Zehender's case.

Stilwill reports a case of traumatic staphyloma of sclera in an Italian coal miner, aged 23 years.

Anterior Chamber and Pupil

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This section reviews the literature of 1919. Its literature frequently overlaps that of the uveal tract.

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DIGEST OF THE LITERATURE.

Heat Currents in Anterior Chamber.—Erggelet states that the movement in the anterior chamber is not only the result of specific gravity but also of radiation, and that the heat currents are interfered with by active movement of the eye. In answer to the question, "Why particles are not deposited on the anterior lens capsule?" he states that the perpendicular position of the lens capsule hinders the deposits.

Plocher agrees fully with Erggelet's theory of "gravitation plus radiation," but disagrees with the statement that no deposits are formed on the anterior lens capsule; which, he states, is quite frequently the case, in cases of acute uveitis. He reviews a case following a discission of secondary cataract, in which he observed the heat movements by means of the dust-like particles in the stream, several of which were large enough to be observed as distinct particles.

Berg has described the heat movements in a very practical way. He made most of his observations with a Gullstrand Nernst lamp, and states that in aphakic eyes the movements can be observed more plainly on account of increased depth of the anterior chamber. He found that the movement in the deepest layer of the chamber is ascending and in the zone nearest the cornea descending.

Viscosity of Aqueous Humor.—A review of the results obtained by previous investigators opens the series of papers by **Guglianetti.** Thus working with the Ostwald viscosimeter, Cavazzani had found the average viscosity to be a little higher than that of water twice distilled, and to be increased in glaucoma. Mastrobuono observed that it became less after standing for 24 hours, possibly through precipitation of proteins. It was increased after injection of saline solution with adrenalin, after ligating the carotid, after mechanical irritation and after extirpation of the cervical sympathetic. Pignatari, making repeated paracentesis, found that the first or second was followed by increase of viscosity, but later repetitions showed it diminished. Guglianetti's own results seem to confirm those of earlier observers, but his investigation is not yet completed.

Aqueous Humor.—Working on the influence of circulation on the aqueous humor, **Löwenstein** made a number of injections of various serums and chemicals intravenously. He found that injection of serum from normal rabbits, human serum, diabetic and coma serum and 10 percent dextrose solution had no influence on the refractive index of the anterior chamber. On the other hand, intravenous injection of sodium chlorid caused a decided rise of the index.

By experiment **Seto** found that resorption of the aqueous was increased by wounds of the cornea, mydriatics, myotics and electric stimulation of the cervical sympathetic. It is diminished by corneal opacities and leucoma adherans, by resection of the superior cervical ganglion, and after death. Corneal diffusion is increased by lowered intraocular tension or the intravenous injection of normal salt solution. Increased intraocular tension, anemia of the bulbar conjunctiva, chemosis and hyperemia and stimulation of the trigeminus retard corneal diffusion. After the cutting of the trigeminus diffusion is first decreased and later increased. **Osborne** discusses the physiology of the aqueous humor. **Nakamura** has experimented with regard to the absorption of arsenic iodin and potassium ferrocyanide into the anterior chamber through instillation. **Ito** reports a study of the aqueous humor in a diabetic rabbit.

Cysts of Anterior Chamber and Iris.—Liese reports a case of cyst of the anterior chamber and corneo-sclera. Seven years before the patient had a penetrating wound of the corneal margin with cataract. Then the eyeball enlarged, and for several months, at the site of the scar, vesicles formed with acute symptoms of irritation. The cyst occupied the anterior chamber, and extended into the cornea and sclera. It ruptured and a rise in tension caused a widening of the wound through which a defect of the corneal margin could be seen.

Zentmayer reports a case of iris cyst of the idiopathic type. It was of chocolate brown color, 4.5 by 3.5 mm., and filled the angle of the chamber from the outer border of the sphincter to the ciliary border. The anterior chamber was deep, and iris reacted well to light. Under the use of pilocarpin, vision increased from 6/9 to 6/6, and tension reduced from 30 mm. to 22 mm. He states that the pathogenesis is obscure, but they have been explained as arising from a blocking of the iris crypts.

Pupillary Membrane.—In **Mayou's** case the cornea was enlarged and there were several ruptures in Descemet's membrane. In both eyes there were several large strands across the whole diameter of the pupil. In the left eye the pupil was eccentric and iris adherent to the cornea in the lower nasal quadrant; no superficial corneal opacity. The right disk was cupped and the left showed a large scleral ring. Tension plus one in both eyes. Both eyes were trephined. The right eye drained well, but the tension remained up in the left.

Two cases of persistent pupillary membrane are reported by **Wiegemann.** In one of them an operation somewhat similar to that done for posterior synechiae was practiced, giving distinct improvement of vision in one eye and clearing of the pupil of the other, which was amblyopic.

Komoto reports a case of persistent pupillary membrane.

Supernumerary Pupils. — Gonzalez gives illustrations of the right eye of a girl of 11 with three supernumerary pupils. The dilatation of the pupil under atropin partly closed the supernumerary openings and temporarily cured the annoying polyopia. The permanent cure was realized by iridectomy, thus fusing the larger opening with the natural pupil.

Irregularity of the Pupil.—Dujardin and **Rasquin,** by the term irregularity of the pupil, qualify any angulation of the circumference. As a result of their studies on irregularity of the pupil they find that it is an extremely frequent symptom in the course of syphilis, especially from the secondary stage onward, and the more frequent with the lapse of time. Such irregularity may be the sole pupillary symptom in advanced syphilis, and they believe that irregularity of the pupil is probably syphilitic in 70 per cent of such cases.

Abelsdorff described ectopic slit pupils in a microcephalic child of normal intelligence. The anomaly was evidently congenital. The parents and a sister were normal.

The vision was 1/2 and there was an irregular astigmatism of 2 D. Homatropin enlarged the pupils, but did not make them round.

Sphincter of the Pupil.—Fuchs believes that a true hypertrophy of the sphincter of the pupil is rare. As an example of the so-called hypertrophy he cites a case of hydrophthalmus and states that possibly the hypertrophy in hydrophthalmus is to be conceived as a compensatory hypertrophy; that the iris is broader because the circumference of its attachment is enlarged, but the pupil is normal. If the stretching of the iris is considered as the cause of its enlargement, it is due to the fact that the pull toward the periphery works against the sphincter, which under the influence of light is concerned in keeping the pupil small. In this case the sphincter has more to do than in a normal eye, which should lead to hypertrophy. He states that in opposition to this compensatory hypertrophy we have a non-use atrophy, which does not appear to occur in the sphincter, for we find it unchanged in cases of adhesions of the iris or where it is inactive on account of a corneal cicatrix. Even in a case of long-standing paralysis no distrophy of the sphincter occurs. He cites a case of an iris constantly dilated with atropin for twenty-five years, which returned to normal after stopping the use of the drug.

Clotet used atropin, cocain and eserin to study their effect on the pupil in lesions involving the nerves. The author also advances the theory that the circular muscle of the iris has a dual action, and that during the act of contraction of the pupil the muscle bundles thicken and become shorter, while in dilatation they lengthen and become thinner.

Mydriasis.—Albright cites a case of traumatic uveitis in which the pupils did not dilate well. The right fundus showed fine floating opacities in the vitreous, no cataract, no evidence of glaucoma, no conus. There was a marked difference in the reaction of the pupil to atropin and cocain. The summary of his observations is as follows: First, there was no mydriasis, either eye, secured by atropin carefully applied, pupils 3 to 4 mm.; second, euphthalmin alone secured some mydriasis, 4 to 5 mm.; third, cocain alone produced mydriasis (prompt), 6 to 7 mm.; fourth, cocain and euphthalmin each 5 percent, secured prompt mydriasis; fifth, cocain in the atropinized eye secured widest mydriasis, 7 mm.

Cabannes explains that mydriasis may be the result of paralysis of the sphincter or it may be from the inertness of the retina. These two conditions can be differentiated from unilateral mydriasis by the fact that the pupil of the non-mydriatic eye contracts in a bright light if the eye in mydriasis has good perception of light. The crossed reflex contracts the pupil of the other eye. When there is no myosis on direct exposure to a bright light, then there is no crossed reflex, and this demonstrates that vision is lost in the eye in mydriasis.

Myosis.—Magitot describes changes in the pupil occurring after ocular injuries with the integrity of the reflexes maintained. Under this heading he describes a symptomatic triad consisting of myosis, myopia and decreased tension. The myosis is variable and is due to a spasm of the sphincter. The myopia rarely exceeds 3 D. and is often accompanied by a transitory astigmatism. The tension is usually from 6 to 10 mm. (Schiötz). This may be accompanied by a hypothesia of the cornea, usually lasting not more than three to five hours, and gradually disappearing. This condition is due to the intraocular sympathetic and disappears with the use of atropin.

Anisocoria.—Tournay states that in the normal state, when the vision is directed to the right and maintained in that position, the pupil in the right eye is dilated more than the pupil in the left; the inverse is produced on looking to the left. Also when there is inequality of the pupils, with the reactions of accommodation and convergence preserved, there is a tendency to a disappearance of the inequality when vision is directed to the side on which the pupil is the smaller. The corollary of this is shown in hereditary syphilis and tabes. But of more interest is the inequality of the pupils produced through a unilateral non-functioning sympathetic. In an examination of a number of wounded patients with a non-functioning sympathetic on one side or the other, the above holds true not only through the contraction of the normal pupil, when looking to the wounded side, but also the dilatation of the wounded side. The explanation of this phenomenon is that the dilatation of the pupil on the side of the wounded sympathetic is operated more slowly. Sluggishness of the dilatation of the pupil on the impaired side gives a greater transitory inequality both in the dilatation and contraction. This he proved by daylight; artificial light, in a dark chamber; and flash light powder in complete darkness.

Landolt discusses inequality of the pupils after trephining and describes briefly the nervous mechanism concerned. This nervous mechanism consists of a contractor center in a crus cerebri, forming a part of the nucleus of the third nerve, and a dilator center situated in the cervical part of the medulla. The dilator part of the mechanism belongs to the sympathetic system, the contractor part to the third nerve. The disorders of movement of the iris are divided into: Paralytic, mydriasis, spasmodic mydriasis, paralytic miosis, spasmodic miosis. The author gives the methods of examination used by all ophthalmologists, and a resumé of the action of drugs on the iris., atropin paralyzing the sphincter, eserin exciting the sphincter and cocain exciting the dilator. Having submitted a large number of cases of unequal pupil, after wounds of the skull, to a very close examination with a method of his own device, the author concludes that the trouble is neither paralytic nor spasmodic, according to the above classification. All symptoms are explained when the action of another factor is admitted, e. g., the state of the vessels of the iris. Landolt admits that the inequality of the pupils following wounds has all the characters of a sympathetic phenomenon and is produced by vaso-motor disorders of the iris.

Functional anisocoria, as defined by **Fromaget, C.** and **H.**, is a clinical syndrome without organic lesion, due to an instability of the supranuclear center which coordinates the pupillary movement. It is a functional inequality of the pupils developed in eyes in which the intrinsic motor apparatus is intact and the iridic functions normal. Coming as a parallelism with functional strabismus, the authors raise the question as to whether these phenomena are manifestations of hysteria or, to employ a better term, of pithiatism, "a state of mind which renders the patient subject to persuasion."—Babinsky. In evidence of this they report a case in which two successive emotional disturbances produced the above condition, although all other examinations were negative except a psychiatric examination giving a diagnosis of "emotional psychoneurosis with psychic, senso-motor, sensitive motor and splanchnic manifestations." They also report a case of anisometropia associated with anisocoria, stating that they believe uncomplicated anisometropia is unable to produce anisocoria unless there be some profound anomaly of the centers of coordination, either of the internal or of the external motor apparatus of the globes. They also draw attention to a form of anisocoria which they style "matutinal functional anisocoria" occurring in individuals educated to auto-observation, usually on awakening and disappearing after ocular movement, or reading. The authors ascribe all cases of "functional anisocoria" to an underfunctioning or functional insufficiency, associated with a disequilibrium of the neighboring centers of the oculo-motor and sympathetic systems and produced only in vitiated and disequilibrated subjects.

On examination of a large number of men, **Barrie** found inequality of the pupils in about 11 percent, in whom there was no sign of ocular disease nor manifestation of disease of the central nervous system. The pupils reacted readily to light and the consensual and convergence reflexes were normal. In each case inequality persisted in the contracted state. He draws the following conclusions:

1. Inequality of pupils is frequent.
2. It is associated with all refractive conditions, with a tendency to be more frequent in myopic conditions.
3. The visual acuity is not affected adversely by the fact that one pupil is slightly larger than the other.
4. The left pupil is more frequently larger than the right.
5. Inequality of the pupils occurs as a physiologic condition.

Kempner describes pupillary disturbances in hysterical fits, reports a case, and shows that it was one of hysteria and not of epilepsy, in spite of the dilatation, inequality and fixity of the pupil. The author believes that from the fixity of the pupil, the diagnosis of epilepsy can no longer be made in all cases, although it must be admitted that a fixed pupil in hysteria is a great rarity. He considers it likely that not only the inequality of the pupils, but also the dilation of the pupil, depends not alone on the irritation of the cervical sympathetic, but that in hysteria, similar to epilepsy, the cerebral cortex is in a state of irritation, which is to be considered as the cause of the mydriasis.

Hoessly discusses the condition of the pupil in cases of traumatic brain pressure, and considers the influence of general and localized brain pressures separately. As a result of his research he finds that the bilateral pupil dilatation following general increased brain pressure depends upon: (1) a central conditional stimulation of the sympathetic; (2) a simultaneous diminishing of the sensitiveness of the oculomotor. The author has shown that the pupil phenomena occurs immediately when the brain pressure exceeds the blood pressure. The pupil phenomena as a result of local pressure expresses itself by inequality of the pupils; that is, by unilateral dilatation of pupil upon the pressure side. He believes that the dilatation of the pupil in unilateral mydriasis always corresponds to the side of increased pressure and that the cause is to be sought in a conduction disturbance of the peripheral oculomotor.

Sergent points out that pleurisy at the apex in syphilitics is liable to affect the pupil.

Pupil Reactions.—Suchy found wide variations in the reaction of the pupils of normal persons and concluded that the foundation of many of the changes was due to diminution of the light that was used. **Dunn** finds in the behavier of the pupils in some cases of glaucoma proof of his theory of the pupil reactions. (See p. 129.)

Ruttin believes that the reaction of the pupil to the faradic current is of diagnostic value and can be developed for this purpose. He found that the pupil reacted slightly to the current, even when it was dilated.

With a special light attached to a Zeiss corneal microscope, **Weve** was enabled to throw the light into the eye, as advised by Hess, for the study of the hemianopic pupillary reaction.

Espino has written on the pupillary reflexes, reviewing the accepted views as to their physiology and classifying them in two groups, normal and abnormal. **Reeves** has written on pupillary dilatation and contraction.

Sarbo describes a new method of examination for pupillary light reactions. The patient sits close to the window, head thrown backward and with both eyes looks at the ceiling, thus placing the reflex from the window underneath the cornea. The examiner places himself between the patient and window to observe the pupil reaction. The usual reflexes are observed. In the Argyll-Robertson pupil an enlargement of the pupil is observed.

Argyll-Robertson Pupil.—Magitot considers the Argyll-Robertson sign in injuries and cites several cases with traumatic A. R. pupil. These are of interest on account of the situation of the lesion. He states that without doubt it is in the orbit, but not in the retina because of the existence of the consensual reflexes still existing; not in the ciliary ganglion on account of the mydriasis present; not in the sympathetic center which is too deep (within 10 mm. of the orifice of the optic nerve entrance) to be affected by a purely ocular and non-orbital traumatism. He also states that the diseased organ is certainly in the ocular globe and does not hesitate to designate it "the choroidal ganglion."

Rasquin and **Dujardin** emphasize the importance of a thorough examination of the patient, including blood and spinal fluid for lues in all cases of Argyll-Robertson pupil and other conditions commonly associated with neuro-syphilis in a patient not suffering from neuro-syphilis, influenza or dementia precox. The only demonstrated etiology was acute alcoholism. With the fixed pupils there was a speech defect, a paralytic facial expression, tremulous tongue and hands, unequal knee and ankle jerks and a rather deficient memory. Altogether this made a fairly typical case of "alcoholic pseudoparesis."

Menninger reports a case of Argyll-Robertson pupils and other reflex conditions.

In **Bachstez's** case there appeared as a symptom of primary carcinoma of the posterior nares with metastases and extension into the lamina cribrosa, cranial fossae and sella turcica, a reflex Argyll-Robertson pupil. The main observed difference between this pupil and the true Argyll-Robertson pupil was that the reflex pupil narrowed upon convergence, whereas the Argyll-Robertson pupil does not. The author concluded that the Argyll-Robertson pupil was due to destruction of the trunk of the oculo-motor nerve.

The Uveal Tract

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This section reviews the literature for 1919. Sympathetic disease is considered separately in the next section. Many uveal diseases are included among the ocular lesions of general diseases and are referred to under that heading. For previous literature see A. J. O., v. 2, May, p. 82.

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DIGEST OF LITERATURE.

Anatomy.—It is still disputed whether organic muscular fibers occur in the choroid, except those of the ciliary muscle in its foremost portion. **Fuchs** found them in the parts of the choroid surrounding the optic disc, in frontal sections through the entrance of the optic nerve, which cut the choroid along its surface. He did not find them in specimens obtained by dissecting the choroid into its strata, nor in cross sections; perhaps, because the fibres are flattened corresponding to the plane of the choroid and will be too thin in cross sections to be recognized with certainty as muscular fibres, or they might be covered with chromatophores. Fuchs, therefore, leaves it undecided whether they occur regularly in the choroid or not. They are recognized by their shape and staining. They form long, flat equally wide bands; the longest was 0.50 mm. long and 0.04 mm. wide, run parallel or in different directions, their surfaces parallel to the plane of the choroid. Stained by van Gieson the muscular fibres are brownish, the connective tissue fibres red; by glia staining of Mallory, dark blue, the connective tissue fibres light brown; by Weigert, intensely bluish grey, the connective tissue light brown, the nuclei light yellow.

As Wolfrum has found no muscular fibres in the choroid of monkeys, pig, rabbit, rat, mouse, in the human choroid they are not supposed to be a rudimentary organ. If one wishes to attribute to them a function this could not be the displacement of the choroid as a whole, since the fibres spread in all directions. They might give a certain tonus to the choroid, which must be assumed if the choroid should, as according to Straub, bear a part of the intraocular pressure.

Physiology.—A paper upon the action of the iris and the changes that occur in it by **Mazzei** must be read in the original. The contribution of **Hesse** on mechanics of the iris movements is based upon observations made upon a young woman with partial ptosis and narrowing of the pupil of the left eye. Cocain caused the right pupil to dilate, but not the left. Eserin contracted both. Homatropin dilated both to 8 mm., and atropin dilated both to 9 mm. Suprarenin did not affect the pupils. Hesse puts forward the hypothesis that the oculomotor and sympathetic nerves neither of them act directly upon the iris, but both influence a nerve center in the ciliary body.

Anomalies. — Pigmentation. — In a group of persons examined at Munich only 32 per cent of the adults retained the blue iris. Among the children of these persons the rate of alteration of iris color varied considerably. In the first three months of life three-fourths of them still retained the blue color; in 6 months it was still characteristic of 70 per cent of the infants; at 9 months and 1 year the blue-eyed population represented 63 per cent and 53 per cent, respectively. This indicates the slow progressive pigmentation of the eyes leading to darker colors in the Bavarian group examined. **Schindler** has called attention in this connection to observations made in Pfaundler's clinic at Munich, on a possible correlation between the rate of pigmentation with corresponding changes in the color of the iris and the nutrition of the infant. According to her, the iris of many malnourished infants, especially with atrophic manifestations from disturbances of digestion and metabolism, may exhibit a change of shade at an age when healthy infants as a rule still retain the blue color. This is attributed to a pigment arising from augmented disintegration of blood pigment.

Gordon reports his observations upon eye color in a long series of discharged soldiers in whom susceptibility to (war) neuroses and psychoses had been demonstrated only by the results of inquiry into accepted and unaccepted stigmata. He distinguishes simplex eyes, i. e., some shade of pure blue or pure grey, from duplex eyes, which comprise all other colors — black, brown, hazel, yellow, green, impure grey and intermediate shades. The suggestions seemed justifiable. 1. That in individuals who are susceptible to neuroses and psychoses, duplex eyes are more than twice as common as simplex eyes. 2. That in the same class of individuals the narrow and abnormally arched palate is present in about 52 per cent of the cases. 3. That in the same class again the proportion of duplex eyes to simplex eyes is markedly increased in those cases with narrow and abnormally arched palates, and the increase tends to intensify along with the intensification of the palatal abnormality. **Bancroft** writes on the color of colloids, and blue eyes.

Melanosis of Iris.—Three cases are reported by **Waardenburg.** It appears mostly one-sided, characterized by a diffuse dark brown to black coloring of the iris, with a change in the relief. Instead of a trabecular design, one sees small warts intermingled with some larger papilloma-like enlargements. The right eye with the melanotic iris of a 15-year-old girl with typical melanosis, had some brown violet spots in the sclera, and a metal glossy fundus without visible intervascular spaces on account of dark tapetum. Cataract in the strongest melanotic eyes seems to be rare. Melanosis, which is an excess of pigmentation of one or more parts of the eye, goes on in a fifth of the cases into melanosarcoma and must be sharply differentiated from heterochromia.

Heterochromia.—Waardenburg showed three typical cases. Here the light eye is the sick one, contrary to melanosis. The prognosis of this light sick eye is favorable, in so far as the secondary cataract can be extracted and the cyclitis and opacities in the vitreous seem not to have a disturbing influence. A section of an excised piece of iris showed, as the only sign of chronic inflammation, a larger number of mononuclear cells with eosinophile granules in the iris stroma. He did not observe Descemet spots in his sixteen cases, but occasionally opacities of the vitreous. He found cataract in

6 cases, 4 were a true lusus naturae without complications, 1 with persistent hyaloid artery, 1 with sympathetic paralysis and 3 with congenital coloboma of iris, 1 of which showed marked remnants of pupillary membrane and anterior capsular cataract with coloboma of the choroid.

These last cases may not be classed with the typical heterochromia of Fuchs. On the contrary, these eyes with congenital defects, showing the greatest deviation and the strongest pigmentation, without speaking of melanosis, must point to another explanation. They cannot favor Fuchs' opinion that the heterochromia is the result of hypoplasia of pigment. Waardenburg wishes to consider it in connection with normal pigment deposit. His investigation of iris bicolor made it clear to him that here a complicated hereditary process cannot be alone considered.

In the discussion van der Hoeve said he had observed a number of cases of heterochromia with cataract, but seldom missed symptoms of cyclitis with the corneal microscope. Heterochromia with sympathetic paralysis is seen in young people, not in those where it originates in old age. The distinction between melanosis and heterochromia seems a little arbitrary. In a patient with one-sided melanosis the other eye developed later opacities of the vitreous and cataract, pointing in the direction of heterochromia, so that here probably both conditions were present at the same time. In none of **Kono's** cases were inflammatory symptoms of the ciliary body observed.

Calhoun reports on his experiments on nine rabbits in which an excision of the cervical sympathetic ganglion was made. There was an appreciable gross change in the color of the iris on the operated side in all except one. The longer the animal lived, usually, the the more distinct was this discoloration, which was first detected about five weeks after operation. In one animal, which died twenty-eight weeks after operation, a decided difference in pigmentation of the irides was noted before and after enucleation. Calhoun's findings did not differ materially from those of Bistis, Fuchs and Lagleyze. The greatest changes were in the anterior border layer, viz., general atrophy of the branching pigment cells and the chromaphores of the vessel layer. In certain areas along the margin of the anterior border layer there was a disorganization or absorption of the pigment cells which probably corresponded to the lighter areas seen on the iris during life. The pigment epithelium was unaffected and there was no sign of inflammation. There was a difference in the thickening of the vessel walls, due to hyaline degeneration, although all of the iris vessels are characterized by thickening of the adventitia.

The great number of clinical reports show the difference in the color of the irides to have taken place within the first few months or years of life, when the pigment cells are young and easily absorbed. Calhoun has not found a record where a sympathetic paralysis in the adult, produced by trauma or operation, ever caused iris depigmentation. His investigations led to the conclusions:

In a small number of cases heterochromia is inherited. In all others it is a symptom of some abnormal ocular state. In a large percentage of cases a paralysis of the cervical sympathetic is the responsible cause for the heterochromia through its trophic disturbances. This paralysis may be inherited. Besides a congenital heterochromia there is an eye disease of unknown origin which begins in heterochromia and ends in cataract.

Heterochromia With Ocular Disease.—With many citations from the literature of this subject, **Franke** reports fifteen cases observed in about 5,000 patients. In a few of these the heterochromia seems to have been preventable and associated with differences in the color of the eyes of the parents. But in nine he observed evidences of uveitis, usually dots and lines on Descemet's membrane, and in the same number of cases some clouding of the lens, varying from minute opacities to ripe cataract. There was also in most cases some clouding of the vitreous. Tuberculin tests, mostly the von Pirquet, indicated tuberculosis in but two of the cases. Neither mercurial inunctions nor tuberculin treatment proved beneficial. The few cases which came to cataract operation showed that heterochromia had no unfavorable prognostic significance.

Congenital Defects of Anterior Layer of Iris.—Bitter gives a critical review of the so far published cases with three of her own. The affection, which must not be confounded with, but sometimes may very much resemble, congenital ectropium uveae, may have various causes. The first group, comprising the cases with partial defects of the anterior layer of the lower portion of the iris, apparently are variations of the same anomaly, which must be attributed to the disturbances in the closure of the ocular cleft. Related to this are other defects in other parts of the iris, associated with real defects of the pigment layer or with typical or atypical colobomas of the eye. A third group was combined with other ocular disturbances of development, especially irideremia and polycoria; and in a fourth were noted anomalies in the formation of the minor circle, e. g., a wall-like elevation, with simultaneous pigment dots on the anterior capsule of the lens. In another case cone-shaped filaments spread from the inner circle into the pupillary area, while the iris stroma at the sphincter was insufficiently developed, perhaps due to abnormal formation of the anterior chamber. In this and the last group the defects are ring-shaped.

While for the partial defects an insufficient development of the iris stroma may be assumed, in the annular defects encircling the pupil, one must think of an excessive absorption of the irido-pupillary membrane. The fact that the defect generally starts from the region of the inner circle is in favor of this. Bitter's own cases belong to this group; two were characterized by defective stripes in the pupillary portion, in which the sphincter formed an elevation, discernible by its light color from the pigment stratum. The absolute regular delineation of the trabeculae, in two cases of defective development of the stroma between these trabeculae, contrasted with the irregular shape of the anterior surface of the iris after inflammations and points to the possibility that if an inflammation has preceded, it occurred in a defective stroma of the iris; and the inflammation was not, as formerly supposed, a cause of the defect. Also heredity observed in some cases may be directly utilized against the assumption of an inflammatory origin of the anomaly.

Okamura gave the clinical reports of various forms of pupillary membrane. One showed around the disc at some distance small intensely white spots, probably congenital.

Aniridia and Coloboma.—A case of unilateral aniridia has been reported by **Moraes.** The case reported by **Ischreyt** presented coloboma of both iris and choroid.

Congenital Choroideremia.—Connor observed a case of this rare affection in both eyes of a soldier, aged 25. Hyperopia + 0.50 vision 20/20 visual fields contracted, hemeralopia, personal and family history negative. Fundus glistening white, over which the retinal vessels appear about normal in size and distribution. The sclerotic is exposed to view over the entire fundus, except a circular area about twice the size of the disc in the macular region, where the fundus has the normal red color. The macula shows a slightly darker spot. A few small ciliary vessels and a few pigment spots are scattered about the fundus. Although the retinal vessels appear normal, the retina is not properly developed over the white area. Choroideremia widely differs in location and extent from coloboma of the choroid, and gives just the opposite aspect from macular coloboma. It must have a different etiologic foundation.

The analog in embryonic life of what later is the macular area of the fundus is a spot on the outer surface of the secondary ocular vesicle, where the first signs of differentiation of the mesoblast into sclera and choroid are seen, the first appearance of the choroid being manifest by a tiny plexus of capillaries at this point. Hence, in seeking an explanation of the cause of choroideremia we must consider that differentiation of the mesoblast of the secondary ocular vesicle into sclerotic and choroid, began in a normal way at the normal point, but for some reason was arrested when only the macular area was supplied with choroid.

Jackson in his comment on the case gives the scanty literature on choroideremia and advocates that every case be carefully studied as to visual acuity, fields of vision, retinal adaptation, intraocular tension, departures of the anterior portions of the uveal tract from normal standards, anomalies of the pupils, accommodation and its occurrence in the lower animals.

Uveitis.—Important pathologic conditions affecting the uveal tract, especially tuberculosis and eyestrain, and of vascular changes that result from uveal lesions, notably myopia, glaucoma and cataract, are given in a general review by **Risley**. **Ichikawa** found in the inflamed uveal tissue fuchsinophile spindle-like formations.

Zentmayer presented a case of uveitis, with disciform opacities similar to a dotted veil, which he at first considered as asteriod hyalitis. In the discussion Holloway, who saw this case, stated that he had observed these snow-ball vitreous opacities in three other cases of severe uveitis. The work of **Urra** on degeneration and regeneration of the deeper membranes of the eye has twenty-six illustrations, including several colored micro-photographs.

Etiology and Pathogenesis.—In quite a large number of couched eyes **Elliot** found extensive scars in the iris, ciliary body and choroid, and in association with these injuries uveitis widely prevalent. The intensity of this inflammation and its seat vary considerably. In some the evidence of iritis, of iridocyclitis, of cyclitis, or of choroiditis requires careful looking for, while in others the inflammatory process had been so severe as to result in a fulminating panophthalmitis. The type of inflammation present, with one exception, was always plastic and was mostly confined to the iris and ciliary body. The plastic mass poured out from these structures had in many cases enveloped the remains of the lenses which can be seen in process of disintegration under the action of the phagocytosis or of fluid absorption. Every stage of the changes produced in the vitreous body could be traced as the result of the inflammatory action in the surrounding parts.

In the better marked instances the exudate reached such a pitch of organization as to cause it to assume (under preparation for anatomic examination) the familiar shape of the vitreous cone. The area of the greatest advance of these changes was in the neighborhood of the ciliary body anteriorly, and of the optic nerve posteriorly. In cases of depression and not of reclination, when the couching was performed from the front of the eye, an organized exudate of the vitreous, which characterized the couched eye had formed, apart altogether from the opening of that body, either by the dislocated lens or the instrument used. Its source must in such cases obviously be from the primary inflammation, set up in the surrounding vascular structures by sepsis.

It is significant that so large a collection of infected globes presented very little evidence of inflammation of the choroid, in spite of the fact that several of the eyes were wounded posteriorly to the ora serrata. The leading choroidal feature was the presence of atrophy, though doubtless this was largely secondary.

Rheumatic iritis has no definite clinical significance. With this view **Folman** examined the clinical journals of the eye department of the Rudolf Virchow Hospital only for those cases of primary seroplastic iritis, in which a specific etiology, as lues, tuberculosis, chronic articular rheumatism, gout, diabetes, arteriosclerosis, acute gonorrhea and other diseases could be eliminated. In forty-four, or 47 per cent of the remaining cases, of "rheumatic iritis," the anamnesis elicited a former gonorrheic infection. In reality this percentage is probably higher because the infection is frequently denied. Every case of iritis of uncertain etiology ought to be very carefully examined for gonorrhea. The favorable results of specific treatment of gonorrhea suggest also for these cases, especially relapsing rheumatic iritis, the employment of vaccine therapy.

A patient of **Leiche**, aged 42, had within three years three severe attacks of iritis and neuralgia of the face, head, neck and shoulder. A skiagram revealed an impacted third molar in the upper left dental arch. Within twelve hours after removal of the second and third molars the iritis subsided, and in a week the neuralgia had disappeared. **Wirths** records chronic latent periodontitis as a cause of iritis. **Bell** showed a case of iridocyclitis with marked ciliary tenderness and diminished tension. The anterior chamber was nearly filled with blood; vision hand movement at 3 inches. One month after removal of a loose tooth, and clearing up of severe pyorrhea, and treatment with hot baths and atropin, vision equaled 20/50, tension was normal, pupil dilated, and blood and exudate all absorbed. **Marco** writes on ocular complications in dental infection.

Magruder presented a woman with bilateral iritis due to an infection of the left antrum. The condition had lasted about three weeks. There was pain on pressure over the left frontal sinus and over the left antrum. The antrum was washed out through the nose, and only boric acid solution was used in the eyes. The next day there was improvement in both eyes, and in one week the patient was discharged, the antrum having been washed out four times. The infection was caused by pneumococcus and staphylococcus.

A girl, aged 18, who had enjoyed good health consulted **Rovinsky** on account of typical serous iritis of the right eye. Wassermann and von Pirquet reactions negative. Under routine anti-iritis treatment the eye improved until a month later the other eye showed signs of beginning iritis. On the previous day she had a heavy meal of meat and tomatoes, and later in the day had partaken rather freely of strawberries. A good dose of calomel with sodium bicarbonate seemed to put her on the right track again, until a month later, when another gastrointestinal indiscretion caused a slight exacerbation in both eyes. She also had two attacks of urticaria and was under treatment. The question in Rovinsky's paper is: Can a case of this kind really be called a focal infection? Or does it more properly belong to that class of disturbances, with the iris as the seat of infection, caused by protein sensitization of ingested food.

Betti reports two cases of panophthalmitis in men of 56 and 38, following a contusion of the eyes. In four and two days the anterior chamber was full of pus, and the eyeballs had to be removed. Cultivation of the germs in the eyes and inoculation of rabbit eyes demonstrated that a highly virulent colon bacillus was responsible. **Coriat** and **Boulai** report a case in which septicemia and endocarditis developed three months after a war injury in the sacro-lumbar region. Two weeks before death a metastatic ophthalmia appeared first in one, and a few days later in the other.

Lundsgaard reports a case of cyclitis in parotitis epidemica. This is a very rare complication of epidemic parotitis. The author's patient was a 12-year-old girl, who presented no signs of tuberculosis, but who had swelling of the glands of the neck and recurring spring conjunctivitis with plyctenules, but no other disease of the eye at the time of the onset of the parotitis.

An epidemic of parotitis occurred in the school where the patient had attended, and along with the typical signs of this disease there was ciliary injection of the left eye, and the visual acuity decreased until the vision was hand movements. The cornea was diffusely opaque, the epithelium thickened, and there were grey spots in the parenchyma, so that the appearance was that of a diffuse parenchymatous keratitis. The iris was hardly visible and the pupil was normal. The tension was normal. The eye rapidly cleared up with no synechiae.

A review of the literature relating to iridocyclitis as an essential part of Mikulicz's disease, including abstracts of three cases, supposed to support that view is given in the paper of **Gjessing.** He then reports three cases observed in Fuchs' clinic with critical remarks upon them, and reaches the conclusion that uveal lesions do not belong to the phenomena of this symptom complex, but that they are associated with other forms of adenitis.

Uveal tract inflammations **Harbridge** thinks are usually not disease entities, but manifestations of a general infection analogous clinically to joint and muscle lesions. Their presence is a signal for exhaustive general examination.

Wessely demonstrated two cases of eye disease in grippe. Acute metastatic ophthalmia of the right eye in a 4-year-old girl fourteen days after typical grippe. Progression to phthisis bulbi from streptococcus metastasis. 2. Bilateral plastic iritis with pupillary exudate and vitreous opacity in a 3-year-old girl, ten days after the grippe. Clearing up of the eye was slow. According to **Thompson,** herpetic eruptions on the sclera may occur in the course of severe attacks of herpes zoster ophthalmicus, affecting the branches of the first division of the fifth nerve, including its nasal branch, and are usually associated with such changes as herpetic vesicles of the cornea, keratitis striata, punctata and iritis. **Mansilla** and **Samperi** each contribute to the literature of ocular complications in grippe.

Heed detailed clinical notes of a bilateral metastatic infection of the uveal tract in a boy, aged 10, during the course of cerebro-spinal meningitis, due to meningococcus. A marked yellowish exudate covered the pupil with turbidity of the aqueous, discolored irides and pupils fixed. Tension plus 1, vision reduced to light perception in one eye. The inflammation progressed for three days and then began to subside. On the eighth day the aqueous was clear. Improvement continued between one and two months after the first examination, there was a very moderate circumcorneal injection, a few tags of posterior synechiae, and several dots on Descemet's membrane. The unusual restoration of vision is credited to four intraspinal injections of meningococcic serum.

Iritis.—A case of iritis papulosa is reported by **Krautschneider;** but most of the papers dealing with iritis have been noticed in the sections on uveitis and its etiology and pathogenesis.

Iris Luxations.—Following an injury from a piece of wood, **Pichler** observed a total evulsion of the iris. Vision 6/12 with + 0.50 and stenopaic slit 6/6. Intense photophobia. This was relieved by a prothesis in the form of a shell, with iris of such a curvature that the patient with an additional + 2. obtained vision of 6/6 and a good cosmetic result. The artificial eye was worn all day without discomfort and removed at night. **Snellen** demonstrated a case of traumatic aniridia after injury with a tobacco box.

Groenouw reported very valuable relatively rare anatomic findings in a retroflexion of the iris of ten enucleated eyeballs. Retroflexion or inversion of the iris consists in a total or partial disappearance of the iris after severe contusion of the eyeball by blunt force. It gives the impression of coloboma extending to the corneal limbus, or maximal mydriasis. Occasionally the border of the lens is visible. Atropin or eserin as a rule has no effect, probably in consequence of adhesion with the ciliary body. On account of the mostly severe traumatic complications, vision is generally very much impaired. Most frequently enucleation must be resorted to on account of secondary glaucoma or inflammatory symptoms. However, considerable improvement may take place after absorption of the hemorrhage (and the lens). In eyes operated upon for cataract the event, per se, has no deleterious consequences. The edges of the coloboma disappear to the side, so that no sharp corners of the sphincter are visible, and the ciliary processes are invisible. The iris cannot be replaced to its normal position, especially as it is generally adherent to the ciliary body.

From his anatomic observations Groenouw distinguishes two kinds of retroflexion, viz., the mostly partial retroflexion or folding of the iris in front of the lens, and the generally complete retroflexion of the iris behind the lens dislocated into the anterior chamber. A theoretical explanation of the occurrence of retroflexion can only be given in perforating wounds of the eyeball, especially after iridectomy or cataract extraction.

Choroiditis.—According to Fleischer, choroiditis juxta papillaris (Jensen) starts from the retina. There are especially large sector-shaped defects of the visual field, the vessels are veiled, the disc changed and there are opacities of the vitreous. In **Krauss's** case of unilateral choroiditis in a boy, aged 17, the lesions varied from a slight yellowish, fluffy swelling of the choroid to a more advanced aggregation and absorption of pigment. There were no vitreous opacities. Wassermann plus 1.

Finnoff presented a man, aged 34, whose vision in the right eye had been failing for a month. He had a bad cold while in France, two months ago, but had been well since. A week ago he noticed a speck in the center of the right field of vision, a small central scotoma. He had frontal headaches, which increased during the day, and the letters blurred when reading. Vision with old glasses 1.2. Wassermann and urine negative. An oval yellowish area with some pigment disturbance, about one-third the size of the disc, was just above the macula. There was some improvement since first seen. Jackson considered the case as of an acute character.

Libby presented a man who stated that in 1906 right vision had fallen to counting fingers, that of the left eye becoming slightly reduced, three months later. Under treatment with K. I. mercurial inunctions, and dionin, vision was restored to normal in one and a half years, and had remained so ever since. The findings in each eye now showed the typical picture of disseminated choroiditis.

Purtscher reported a case of a man with vision of 3/60. The cause of the disturbance was a new central choroidal inflammation of about 2 P. D. (papillary diameters). Peripherally, especially nasally, were many other old disturbances. For more than thirty years the man had had no vision in the left eye. Clear cornea, and anterior chamber medium depth. It was shrunken, quiet, iris strongly atrophic, veins dilated, pupil narrow, and the margin blended into the lens capsule. No pigment in the temporal part. The margin of a yellow, shrunken calcified lens is visible temporally. Great masses of floating exudate in the vitreous, seemingly emanating from the curled-up and cracked posterior surface of the lens.

Treatment of Uveitis. — Paradies treated two cases with subcutaneous injections of strychnin. The first case was chronic irido-cyclitis. Atropin and scopolamin were instilled into the eyes without results. Strychnin was given subcutaneously and the next day the cyclitis showed signs of clearing up. Each day showed improvement, and the patient was finally discharged as cured with vision of R. 5/7, L. 5/7–5/5. The second case occurred in an anemic girl with rheumatic polyarthritis. Bilateral rheumatic iritis, treated with atropin and scopolamin with little improvement and many relapses. Strychnin was finally injected subcutaneously. The eyes improved rapidly, and in two weeks the patient was discharged as cured with vision R. 5/10—5/7, L. 5/7—5/5.

The author explains this as follows: The irido-cyclitis was due to stasis of circulation. Strychnin acts selectively on the circulatory centers of the medulla oblongata. When the strychnin started to take effect, the vessels in the iris began to receive their normal amount of blood with improved circulation, and the cause being removed, the iridocyclitis rapidly cleared up.

In **Libby's** case in which a Wassermann was negative, and there was no history of specific infection, vision was restored from counting fingers to normal under treatment with K. I., mercurial inunctions and dionin. In **Nelson's** case of syphilitic gumma of the iris mercurial inunctions and iodides brought about a cure. **Zusi** obtained in his case of bilateral uveitis, with hypotony and turning grey of the hair, by antisyphilitic medication, gradual healing of the ocular affection and general improvement.

Syphilis.—A young man exhibited by **Nelson** had a tumor of the iris which was diagnosed as gumma. **Piemont** saw three months after the initial symptoms appeared a woman with typical iridocyclitis of the right eye. Tension equaled 50 mm. (Schiötz). She had syphilis e marito. This was shown in the eye by a series of gummata at the inferior temporal sector of the iris.

Zusi's patient, aged 14, suddenly noticed dark shadows in both eyes, terminating in complete blindness. Anterior chamber very deep, with precipitates on the posterior surface of the cornea and on the lens and iris, adherent forming a funnel backwards. Tension R. 11 mm., Hg. L. 5 mm. Hair and cilia were said to have turned gray and were falling out forty days after the onset of the disease. In Krauss's case of unilateral choroiditis Wassermann was plus 1. Jackson considered the appearance of Libby's case as that of syphilitic disseminated choroiditis, as there were so many smaller spots without areas of complete atrophy.

Tuberculosis.—The clinical histories and histologic findings in four cases of tuberculous iritis are reported by **Tooke.** This may be clinically indistinguishable from other forms of chronic iritis, but microscopic section revealed tubercle systems or the presence of bacilli. There is no such thing as a site or predilection for the tubercle of the iris. Each of the patients was a female, ages ranging from 18 to 46 years. The iris in case two was markedly infiltrated with large and small mononuclear leucocytes and polymorphonuclears, that details of the iris stroma and its component vascular arrangement could not be determined. Definite tubercles were scattered over the anterior surface of the iris, mostly on the pupillary margin. These consisted of fibrinous material and of lymphocytes with occasionally epithelioid cells, and others in which an early stage of necrosis may have begun. Giant cells were present.

The pigment layer was distinctly disintegrated, and was thrown off into the anterior chamber. It had been collected at certain foci as definite masses, and when plastered down to the anterior lens capsule formed dense posterior synechiae at the region of the pupillary margin. At a greater distance from this, these synechiae were less dense and an iris bombé was clearly shown with occlusion of the infiltration angle. In case 3 a definite tuberculous nodule with a central giant cell was apparent in the filtration angle, another in the ciliary body of the same side, close to the root of the iris. The iris was injected and showed small tubercles, in the process of formation in its stroma nearer the filtration angle. So much of the iris was necrotic and amorphous, included in the ulceration of the cornea, that one may reasonably suppose that the presenting portion may have formerly been more extensively diseased. There were no giant cells in this portion. In case 4 the infiltration was so intense that actual tubercle systems could not be detected in the iris.

Gilbert repeatedly observed in chronic uveitis, partly after tuberculin injections, tuberculids of the iris, which differ from the usual tuberculous nodules by their especial smallness and tenderness and by their rapid appearance within a few hours. They do not frequently occur, but if they do they are apt to elucidate the etiology of obscure cases of chronic uveitis. Gilbert then discusses the diffuse tuberculous iritis which has nothing characteristic, but is to be considered as perifocal inflammation in the surroundings of the nucleus of the tuberculous new formation.

In many cases of disseminated choroidal patches, with progressive loss of vision and pain in the eyes and head, **Risley** has seen the process arrested by the administration of old tuberculin. Tuberculosis must, therefore, be regarded as one of the more common causes of disease of the uveal tract. Although the majority of patients affected with tuberculous choroiditis are robust and apparently healthy, and although corresponding animal experiments may be negative, Gilbert admits for the attacks and aggravations of the disease the probability of spreading by metastases. Just as frequently is undoubtedly the propagation by continuity. Occasionally severe headache is observed in tuberculous choroiditis, as a slight accompanying meningitis phenomenon. If choroiditis is complicated by neuritis, this is not secondary, but due to direct metastasis in the optic nerve. Automatically we have pure primary choroiditis, in which the secondary change of the pigment epithelium and the external retinal layers often are strikingly slight, so that a primary chorioretinitis is out of the question. Fleischer found that the microscopic examination of choroiditis juxta-papillaris showed changes of the vessels suggesting tuberculosis. Only in case 4 of tuberculous iritis of **Tooke** was evidence of an active or acute inflammatory condition of the choroid, with considerable inflammation of the ciliary body, and the more anterior of the choroidal vessels showed a decided injection about their walls.

A case of solitary tubercle of the choroid under observation for four years is reported by **Ginzburg**, with sketches of the ophthalmoscopic picture at the beginning and end of this period. The original lesion was about the size and shape of the optic disc and involved the lower nasal macular region. The white area, enlarged vessels particularly, veins and hemorrhages were present. At first there was no pigment deposit, but in the end considerable areas of the adjoining choroid had undergone atrophy and pigmentation. About four months after the case was first seen additional smaller tubercles appeared in the periphery of the fundus.

In **Purtscher's** case of a new central choroidal inflammation vision rose under tuberculin treatment and injections of normal salt solution from 3/60 to 6/24. **Snellen** demonstrated a severe form of choroidal tuberculosis, and specimens of an eye which clinically had appeared as a sarcoma that had proliferated from within outward, while the anatomic examination showed an ectasia consequent on intraocular tuberculosis.

Davis saw a child with tuberculosis of the choroid. She showed a spot of choroiditis near the macula of the left eye. A von Pirquet was negative and the child was placed on antisyphilitic and tonic treatment, which was not effective. A few weeks later a trauma ruptured the choroid in the macular region. Soon after the patient was lost sight of. Six years later she reappeared with a history of severe headache and nausea with blurring of vision in the other eye, of 20/40. There was a greyish area below the macula and a paracentral scotoma above. A von Pirquet at this time indicated a slight rise of temperature, and there was a reaction on the arm and in both eyes. One mg. of old tuberculin resulted in a marked local, focal and general reaction.

Cutler presented a man, aged 34, whose vision of the left eye had been failing for three months with conglomerate tubercle of the choroid. His general health was good and the general tests negative. A greyish-white mass, without appearance of stroma raising abruptly to an elevation of from 4 to 5 D. covered the macular region, of the aspect of a subretinal tumor, 2 d. d. vertically and horizontally. There was much edema between it and the nerve especially upwards where the vessels were in places covered by whitish flocculent masses. When first seen there had been no hemorrhages. Under tuberculin treatment there seemed to be occasional increase of edema with small hemorrhages. After about four months the tumor had not been notably reduced in size, although the surrounding edema and irregular deposits in the retina had diminished. It is the rule in isolated tubercular choroiditis for the deposit to undergo retrogressive changes, leaving an atrophic spot without treatment with tuberculin, but with due regard to the hygiene and general health of the patient analogous to the healing of tuberculous foci in the lungs and elsewhere.

In **Bane's** case of corneal and uveal tuberculosis tension ran to 60 mm. Hg. A scleral puncture gave only transient relief. Sclerocorneal trephining was done and tension became subnormal. Jackson has seen rise of intraocular tension in connection with other cases of tuberculosis, and uveitis, and from his experience finds there was a decided tendency in this direction. An operation in this case should not be hastily undertaken. If the original process subsided the tension was also likely to come down. Black objected to an iridectomy or trephining on account of the risk of hemorrhage.

In **Purtscher's** case of a recent central choroidal inflammation, vision rose from 3/60 to 6/24, under tuberculin treatment and injections of normal salt solution. **Cutler** maintains that no case should be subjected to the massive diagnostic injection without a very careful physical examination. In diagnosis violent reactions are not necessary and may be dangerous, and in treatment reactions are detrimental, and the best effects are obtained by small doses of tuberculin with gradual increase, omitting the treatment or reducing the quantity when the slightest sign of hyperemia appears.

Davis emphasizes that in all cases where the etiology is in doubt the tuberculin test should be used as a routine, just as the Wassermann test is. His practice was invariably to make the von Pirquet test in adults as well as in children. If this very delicate test proved negative, it eliminated at once tuberculosis. If the test was positive or partially positive, the subcutaneous injection of O. T. should be given; the first dose ½ mg. If this proved negative, then 2 mg., and if this proved negative, 5 mg. If no reaction was obtained, then again tuberculosis was excluded.

For treatment he used H. K. Mulford serial dilutions, altogether B. E. and O. T. mixtures. Formerly he used the mixture B. E., almost exclusively for therapeutic purposes; but lately had gone to the use of O. T. preparation. He began with the smallest dose (2 min.) of the weakest (No. 1) dilution, and increased 2 min. a dose until the maximum dose (20 min.) was given, or until he got a mild reaction. If this reaction was not obtained with No. 1 dilution he used No. 2 dilution, beginning with 2 min. and increasing as with No. 1, and so on with dilutions Nos. 3 and 4 until a reaction was secured. This was indicated by a mild rise of temperature, ½ to 1 degree, a slight redness at the site of the injection and perhaps a mild focal reaction in the eyes.

We should be exceedingly careful, however, how we stir up focal reactions in the eye. Reactions are necessary as a guide to the physiologic tolerance of the patient and to secure full effect of the remedy.

Degenerations.—A case of benign proliferation of the epithelium of the ciliary body is reported by **Velhagen.** The mass having a diameter of 1½ mm. was made up of epithelial cells with distinct nuclei. Although resembling somewhat an adenoma, it could not be classed as such, or as papilloma, there being a complete absence of blood vessels. The eye in which this was observed had been blind and degenerated for twenty years, and was enucleated for absolute glaucoma. The fellow eye was normal.

An interesting form of shrinking of the iris is described by **Fuchs.** Of five cases that he has seen, all but one showed this condition connected with increased intraocular tension. This one occurred in a boy whose eye was entered by a foreign body, which was removed. In two weeks after the removal the iris had shrunken until most of it was behind the limbus, and the exposed portion of the anterior surface covered with the posterior pigment layer. Later the eye was enucleated. It was found that the narrowing of the iris to about 1.5 mm., which was caused by a membrane closely adherent to its anterior surface, which in contracting had drawn upon the free edge of the iris and being adherent to the pigment layer beyond the original margin of the pupil, had folded this layer so that the ectropium uveae was made up of the pigment layer folded upon itself. See Fig. 11. Fuchs points out that this can only occur when the pupillary margin is not bound down by

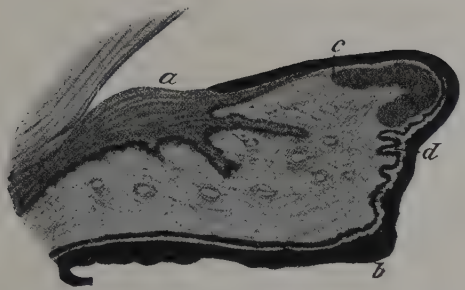

Fig. 11. Shrinking of Iris with Eversion of Pigment Layer (Fuchs). (a) A new-formed membrane, the contraction of which causes the changes in the iris. (b) Right angle in the pigment layer caused by the drag upon it. (c) Section of sphincter of iris distorted by the traction. (d) Folds made by shrinking of iris.

synechiae. In that case an atrophy of the iris would result. Exudate on the posterior surface might cause a similar holding back of the iris, and other forms of shrinking must be supposed for some of the reported cases.

Two cases of vitiligo of the iris are reported by **Löwenstein.** Both patients were men of about 40, who gave the history of having suffered smallpox in boyhood, although one of them showed none of the characteristic scars, but had a positive Wassermann. The spots from 1/4 to nearly 1 mm. in diameter appeared grey and sunken in the brown iris.

Sympathetic Disease

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DIGEST OF THE LITERATURE.

Theories of Sympathetic Ophthalmitis.—The two cases of **Harbridge** are used by him to present an indefinite theory tracing a similarity between sympathetic ophthalmia and focal infections and to draw certain conclusions. One was an ordinary plastic irido-cyclitis evidently the result of tooth infection, and the other following cataract extraction. In neither case was the eye removed; so that both must be considered as irido-cyclitis and not as proven sympathetic ophthalmia. He believes that microorganisms entering the exciting eye through injury may be established elsewhere in the body.

Cooke states that the point of his paper is to call attention to the possible relation of certain cases of sympathetic ophthalmia and focal infection. He gives an hypothesis and reports five cases, all of which were typical examples of focal infection. He concludes that sympathetic ophthalmia is an anaphylactic inflammation, but thinks a focal infection caused by an invader similar to that implanted in the exciting eye may furnish the larger dosage required to determine anaphylaxis.

Knapp speaks of the anaphylactic theory, and gives four cases. A mild one responded to enucleation and general treatment. Two others when cited still presented evidence of disease, as shown by deposits on the cornea. The last case seems to have done well by removing several possible causes of infection—teeth, sinuses and gall bladder.

Bierhaus has written on tuberculosis and sympathetic ophthalmia.

Nakamura, to emphasize the reality of sympathetic ophthalmia, says if a kidney on one side be injured, that of the other side may become inflamed. He likewise claims the same with the liver—when one lobe is injured the inflammation may be communicated to all parts. This is due to the freeing of the albumin of the ruptured tissues, which acts as an antigen in the blood, and develops an antiserum which causes damage to tissues of a similar character. Therefore, antiserum of the uveal tract is dangerous, for when injected into the anterior chamber it produces a plastic iritis.

A soldier who was injured in the left eye by a piece of a hand grenade was seen by **Peters.** The right eye, as a result of a former accident, was aphakic, with a glass vision = 5/36. There were floating vitreous opacities, but the retina was clear. The left eye, the one last injured, was myopic, with vision equal to fingers at 2.5 m. with a — 4 = 5/24. Near the papilla there was a highly colored area, but there was no central scotoma or contraction of field. The Neurological clinic reported the man as hysterical. Peters has a confused idea of sympathetic ophthalmia. From this case as a basis he draws the deduction that sympathetic ophthalmia is mainly a mental condition.

De Lapersonne, who also refers to functional conditions, urges that they be not interpreted as sympathetic ophthalmia. A man of 45 was injured; a traumatic cataract resulted. Various muscle paralyses developed, but no sympathetic ophthalmia.

Zentmayer has reviewed and summarized in clear, condensed statement the more recent views and observations bearing on the nature of sympathetic ophthalmia.

Gifford, discussing the priority of sympathetic ophthalmia as described in the literature, refers to the early works of Mackenzie. The disease first mentioned in the 1830 edition was added to and modified until the 1854 edition. Lawrence, in 1833, gave an accurate description of the disease as we now know it, and for that reason Gifford has properly urged the recognition of Lawrence's work.

Pathology.—One of the most important communications of the year from a pathologic standpoint is the article by **Böhm,** who refers to the endogenous origin of sympathetic disease, and reports nine cases of subconjunctival dislocation of the lens causing it. The enucleated eyes all showed the typical pathologic changes, so that the question he asked himself was: "Why sympathetic disease had not been prevented by enucleation, and what was the value of removing the eye?"

A 62-year-old woman was kicked in the eye by a horse. The lens was dislocated up and in, with a coloboma above. There was no light perception. The left eye with correcting glasses gave full vision. On the second day the injured eye was enucleated, but a week later the remaining eye became involved with pericorneal injection, posterior synechiae and vitreous opacities. Using mercury and benzosalin the disease continued to progress, and when last seen a year later, the eye was still irritable with Descemet's deposits, exudate on the lens and dense vitreous opacity. Vision = Fingers 3 meters. Histologically the interesting point was the finding of sympathetic disease where clinically there was no evidence of any external wound in the conjunctiva.

Another of his cases, a boy of 12, struck in the eye by a brick, causing an infection with a penetrating wound of the sclera to the nasal side, uncertain light perception and large vitreous hemorrhage. Fourteen days later the eye was enucleated, but ten days after operation the other eye became involved, and the vision dropped from 6/6 to 6/36. Despite the use of mercury and benzosalin, the disease progressed. Secondary glaucoma demanded an iridectomy, but the coloboma became filled with exudate and the eye became blind.

In contrast to these two cases was one in which a man was injured. A small iron splinter entering the nasal side of the sclera was removed with a small magnet, and vision with correcting lens = 6/12. Three years later he presented with evidence of irido-cyclitis in the same eye, detachment of the retina and no light perception. There was no irritation of the other eye, the veins were congested, with hemorrhages and white masses. This, however, was proven to be a luetic neuro-retinitis.

This communication, therefore, draws attention to the fact that although clinically the conjunctiva may be intact, microscopically there may be sufficient opening to allow the entrance of infecting material.

Ribstein had two cases with a previous epithelial injury to the conjunctiva. In one the end result was poor, following sub-cutaneous injections of sodium chlorid, mercury and salvarsan. His second case, treated with 5 per cent sodium chlorid, gave a visual result of 5/5. Microscopically both showed the typical uveal infiltration. Considering that the only possible external wound was epithelial, he infers that his cases tend to prove the endogenous origin of sympathetic disease.

From the microscopic findings in sections of an eye which was enucleated because of sympathetic ophthalmia, **Bruckner** proves that mononuclear leukocytes emigrate through the blood vessels in the same manner as the polymorphonuclear leukocytes. He believes that the reason for the dispute over the source of the mononucleated cells, which are found in chronic inflammatory processes, is because the tissues are not fixed soon enough after their removal.

The author saw mononucleated cells in all stages of emigration through the walls of the medium-sized veins near the areas of infiltration in the choroid. He believes that the emigrated cells have the power of multiplication after they leave the blood vessels. There is no means to prove that some of the round cells do not originate from the fixed connective tissue cells in the involved area, but Bruckner contends that emigration of mononucleated blood cells also takes place, and they are seen surrounding the vessels.

The author reviews the various theories which have been advanced on the subject, and several illustrations of the various stages of emigration of mononucleated leukocytes through the vessel walls accompany the article.

Ichikawa describes the pathologic examination of seven eyes showing the accepted picture of sympathetic ophthalmia. He found no spirochetes, tubercle or other bacteria, but describes spindles measuring from 6.64 microns to 2.82 microns in length and from 1.0 microns to 0.5 microns in thickness which stain unevenly, lighter and darker portions alternating, so that they show a spotted appearance. They are fuchsinophile, not acid-fast, but alcohol-fast; in long exposure to acid they lose their stain quickly. Giemsa and eosin stain slightly, but methylene blue and Gram are negative. The spindles were present in five of the seven cases, but in only two were they numerous.

He could not demonstrate them in three cases of phthisis bulbi or three cases of non-sympathetic uveitis after perforating injury, or in one case of tuberculosis of the iris and ciliary body. He feels that the spindles are not artefacts, for in the five eyes that showed the positive results, four were fixed in Mueller and one in Orth-Mueller solution. Of the other two eyeballs which were negative in his experiment, one was fixed in Zenker's and the other in formalin. The author does not believe that the spindles are of the nature of microorganisms, but rather considers them the crystallization of the eosinophile granules. Although he does not believe them of any importance in the etiology of sympathetic ophthalmia, he suggests further investigation to determine their true nature. To demonstrate these bodies, he used the following modification of Ohtori's stain:

1. Staining with carbol-fuchsin for three to four hours (better in incubator).
2. After rinsing in distilled water for five to six seconds, stain in the following solution: Saturated solution of picric acid, 100.0; indigocarmin, 0.5.
3. Wash in distilled water.
4. Differentiate in absolute alcohol.
5. Xylol balsam.

Frequency in the War.—Truc has not seen a case of sympathetic ophthalmia in the army, although he has performed many preventive enucleations. He reports a case in civil practice, which followed a blow on the right eye during a game of football that produced hemorrhage with loss of sight. Six weeks later the left eye presented photophobia and injection with failing vision. The right eye was enucleated and this followed by intraorbital injections of electrargol. The usual treatment for sympathetic ophthalmia was of no avail, phthisis bulbi resulting. Throughout the course of the disease there was vertigo, weakness of the legs, malaise and general depression. He discusses the difference between sympathetic ophthalmia and sympathetic irritation with the indications for treatment. In the former, enucleation is demanded. In the latter, it depends on the degree of irritation, sex, age, profession, social condition, family wishes and medical supervision, whether enucleation or one of the less radical operations should be performed.

Morax refers to the rarity of the disease and reports three cases; one an injury by a hand grenade, another following surgical operation and the last case, which was reported in detail, followed a blow on the cornea, with prolapse of iris. The other eye developed irido-cyclitis and the vision was reduced to 1/5. Neosalvarsan was given with some improvement of vision, but later there was decreased tension and greater evidence of disease, so that six weeks after injury the injured eye, which was shrunken to a hard mass, was removed. Examination of the globe showed two areas in the region of the sclera of choroidal lymphocytic infiltration.

Dimmer, in a comprehensive summary, speaks of his own experience in the Austrian army, and draws conclusions from the published reports of other observers. Grosz, in 576 severe ocular injuries, many causing blindness in both eyes, saw no case of sympathetic disease. Neither Uhthoff nor Oleynik observed a case. Sachs and Birch-Hirschfeld each cite one case. The statistics of the Franco-Prussian war are commented, upon and Dimmer doubts the accuracy of diagnosis in many of the ninety-nine cases in the German army during that period. He, therefore, infers that sympathetic disease was a very rare condition in that and in this past war.

Reviewing the war injuries of his clinic, with reference to the time that had elapsed between the injury and the enucleation, he found the following: The total number of enucleations was 142, including cases enucleated elsewhere which came to the clinic for examination. Of these, 60 were gunshot injuries, 16 bombshell, 36 shrapnel, 3 stone splinter, 8 hoof kick, 5 stone cast, 3 bayonet stab, 1 cartridge, 1 explosion, 1 glass, 1 tree branch, 1 blow. In 11 of these cases the date of the injury could not be obtained, so that the interval between the injury and the enucleation was ascertained in 131. Of these 22 were enucleated within the first two weeks after injury; 46 cases, 2 to 4 weeks; 24 cases 4 to 8 weeks; 20 cases 6 to 8 weeks; and 19 cases still later than 8 weeks. This shows that in a very large number of cases (83.2 per cent), enucleation was resorted to later than absolute protection against sympathetic ophthalmia is to be expected. He believes the early enucleation and the general healthy condition of the patient may be possible reasons for the good reports.

It is to be noted that Schirmer has shown that sympathetic ophthalmia generally appears within the first year after the injury, and usually after the fourth week, most frequently between the sixth and the twelfth week after the injury. If it could be shown in a very large number of war injuries that sympathetic ophthalmia was observed almost without exception where the injured eye was removed relatively late, i. e., after the sixth week, and if the number of sympathetic ophthalmias is about the same as that which we ordinarily find after injuries or eye diseases which are prone to cause it, we would have to conclude that the marked reduction in the number of sympathetic ophthalmias in war injuries is due to timely enucleation, a fact that would deserve the widest publication.

If the rare occurrence of sympathetic ophthalmia in war injuries is not due to the early enucleation, but to internal causes, then an explanation of this fact would have to be looked for. There may be a certain predisposition on the part of some individuals, poorly nourished patients and lymphatic children are prone to the disease. Changes in the blood were reported by Ormond and later verified by others.

If internal causes are to be accepted as a reason for the rare occurrence of sympathetic ophthalmia with war injuries, the physical fitness of the soldier deserves consideration; also whether or not some general condition, overlooked at the time of medical examination, or which developed later in the course of the war, could be responsible in those cases which did acquire sympathetic ophthalmia.

It is **Oppenheimer's** belief that the early removal of eyes which had been severely injured during the war has prevented the possibility of the development of a large number of cases of sympathetic ophthalmia.

Clinical Reports.—The case of a 26-year-old soldier, injured by a splinter of iron, causing a prolapse of iris which was covered by the conjunctiva, was reported by **Meller**. Fifty-six days later sympathetic ophthalmia developed, without previous pain, tenderness or redness. After five months of treatment the disease was cured and the vision restored to normal. The injured eye showed no irido-cyclitis or the usual symptoms of sympathetic disease.

His second case was also a 26-year-old soldier, injured by a hand grenade. There was little injection, no injury to the cornea or sclera, pupil widely dilated under atropin, several small floating and fixed hemorrhages in the vitreous; no view of the fundus, vision light perception at 1 meter, and projection uncertain. The vision of the uninjured eye 6/9. By magnet, after an iridectomy, an irregular piece, 2 x 2 x 1 mm., was removed and the healing was uneventful. However, the next day there was less light perception, and twelve days later the scar was retracted without inflammation, and the eye was enucleated. Twenty-five days after this sympathetic ophthalmia developed in the other eye, starting as a slight irido-cyclitis, which later developed real sympathetic disease. The end result was good.

Histologically, the infiltration consisted of small cell masses throughout the choroid, beneath the innermost layer and not limited to the region of the wound. Chorio-capillaris and pigmented epithelium were intact. The thickening of the choroid, he believes, if it could have been seen with the naked eye, was sufficient for the diagnosis of sympathetic disease. The scar was solid and in only a few sections were there round cells.

In this case there was no evident wound, no pus organisms, but the injured eye was finally lost by the shrinking following the mechanical injury which caused detachment of the retina. He believes that sympathetic disease would not have developed in this case had he more carefully noted the decreasing light perception and projection of which he has often spoken as an indication for immediate enucleation.

Stargardt's case was that of a soldier of 33, who was injured in the right eye. Two wounds were evident—one about the size of the head of a needle to the lower outer side, and the other to the upper and inner side of the cornea. Because of the marked hyphemia, no view of the fundus was obtained. Tension normal. Light perception in the temporal field. Twenty-six days after injury irritation developed, and the following day the eye was enucleated. The vision of the other eye changed seven days later as a result of choroidal disease, which showed first as an indistinct red disc, full vessels and a definite area of choroidal swelling several times the disc size. Vision, 8/18; Wassermann, negative; blood showed a slight relative lymphocytosis. The swelling continued and the retina became detached up and out while using mercury and 606. Benzosalin was started after thirty-seven days of mercury and continued in doses of 5 to 8 grams per day. The end result was vision of 8/7.5 with a normal field, although some irregular pigmentation persisted.

Sobhy reports three cases diagnosed microscopically, of which two were cured and the other disappeared from observation with vision of 1/60.

Kalt reports a case of injury in which the eye was enucleated within four days. Six weeks later the other eye developed sympathetic ophthalmia and examination showed a foreign body in the choroid and sclera.

Hirschberg's case was first injured when 7 years old. The left cataract was operated upon, and for six years vision was good. A woman's hat then struck the eye and started sympathetic disease which ended in atrophy of the globe.

Marin Amat reports a case in which a secondary glaucoma developed in an eye which had a leucoma adherans following an injury. An iridectomy relieved the pain. Later the globe became red and photophobia and pain appeared. Bulbar redness, photophobia and pain developed in the fellow eye. The exciting eye was enucleated and microscopic sections revealed several areas of chronic inflammation in the choroid. The blood examination showed an increase of large mononuclear cells to 9 per cent, and of the lymphocytes to 35 per cent.

Moore's experience was with a penetrating wound of the eye with prolapse of iris and ciliary body. The prolapse was removed on the seventh day and the eye enucleated on the twenty-first day after injury. Twenty days after enucleation there was a slight mistiness of vision, tenderness of the globe and a haziness of the lower part of the cornea. Fundus negative except distension of veins. Deposits on Descemet's membrane presented, but five doses of neosalvarsan caused them to disappear, although subsequently they returned. The end result of the condition was not reported. The blood count was normal, Wassermann negative and no foreign body was shown by X-ray.

Nogowa observed a Chinese worker with sympathetic ophthalmia, who had the left eye injured. The right eye showed an area of choroiditis with central pigmentation nearly as large as the disc, with peripheral small white spots and a papillitis. These lesions showed during the first week after the injury. Despite enucleation, on the thirty-seventh day, the vitreous became cloudy and the iris inflamed. Vision gradually rose to 1/10 and the fundus cleared somewhat. The eosinophiles were increased in the blood, but none of the spindle-formed crystals described by Ichikawa were found.

Treatment.—Encouraged by the good results obtained by Pochier, who treated septic processes by producing fixation abscesses, **Van Lint** with Coppez followed his method of treatment in four cases of sympathetic ophthalmia. The treatment was started at the time of the enucleation of the exciting eye in two of the cases, and in the other two several weeks after enucleation. In all four there was rapid improvement, with diminution of the circumcorneal injection, clearing of the media and dilatation of the pupil.

The abscesses are produced by injecting 1 cc. of pure oil of turpentine into the subcutaneous tissue of the flank. Strict asepsis should be observed during the injection. In a few days an abscess, which is filled with aseptic pus, develops. About the seventh day the abscess is incised and its contents evacuated. In the young or weakly the size of the injection can be diminished.

Among the various therapeutic measures advanced during the year was lumbar puncture by **Sourdille**, and the essence of turpentine by **Terson** and **Dor**.

Rothholz believes benzosalin a valuable drug in the treatment of sympathetic ophthalmia, and to substantiate his view reports the case of a 25-year-old man who was seen twenty-four days after an injury to his left eye. There was considerable congestion of the conjunctiva with lid swelling, a limbus scar with iris incarceration, yellowish vitreous reflex, good light perception but poor projection and a negative X-ray. The right eye was normal. Five days later, because of failing accommodation, the left eye was enucleated. Vitreous opacities in the right eye, posterior synechiae and Descemet's deposits followed. Mercury was used to salivation, also potassium iodide. But no good effect was noted until benzosalin was given, 5 grams a day, and later increased to 8 grams. Eventually the right eye was cured.

Dor speaks well of sodium salicylate. His experience was with a soldier who refused enucleation even after the development of sympathetic ophthalmia. The man had a limbus wound of the right eye, with prolapse of iris; a conjunctival flap covered the wound after the iris was excised. The pupil was oval, lens clear, but vitreous too opaque for fundus detail. Vision, 1/30; tension, normal. After the left eye had been involved two months, as evidenced by dilated pupil, deposits on Descemet's membrane, vitreous opacities, congested fundus and vision 1/20, he was seen by Dor, who gave 440 grams of sodium salicylate, cyanid of mercury, injections of auto-serum and mercurial ointment for three months. His vision was then, right eye, 1/5; left, 2/3.

Arruga comments on the use of salvarsan, which was first introduced in Spain for this condition in 1910. He has had favorable results in the vast majority of cases since the time he started such treatment in 1914. He feels that the more advanced the lesion, the more brilliant the result of the salvarsan treatment, and that in the gravest cases the improvement has been most marked. Emphasis is laid upon the necessity of examining the exciting eye, which should show the typical histologic appearance, and that the Wassermann reaction be negative. The aggravation of the ocular symptoms, which often occurs the first few days after the injection of the salvarsan, is always followed by manifest improvement. He maintains that by using this drug the prognosis is less serious. No blood count is given, although a bibliography is appended.

Van Schevensteen summarizes the known facts and theories of sympathetic ophthalmia. During his service in the Belgian army he saw only two cases. One was treated with novarsenobenzol with good result; the other was not improved by it. He urges that enucleation, as a preventive, be done within two weeks of the injury.

Garcia Mansilla has reported cure of sympathetic ophthalmia by enucleation.

Glaucoma

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This review brings the literature of the subject from April, 1919, to April, 1920. For previous references see A. J. O., v. 2, 1919, May, p. 109, and June, p. 113.

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DIGEST OF THE LITERATURE.

Physiology of Ocular Tension.—The sphygmomanometric value of the Schiötz tonometer is again taken up by **Bailliart,** who refers to a previous article wherein thirty-six patients, normal so far as the intraocular tension was concerned, there was oscillation with weights varying between 5.5 and 15.0 gm. This is called the ocular pulse, and is due to the dilatation of the retinal and choroidal arteries at the time of the left ventricular systole.

By means of an ingenious apparatus, which he describes, the movements of the pointer are photographed, and can be studied at leisure. The ocular pulse is slightly earlier than the wrist pulse. It has an abrupt ascent, a longer level and a gradual descent, the latter sometimes showing a distinct dicrotism. Several cuts give reproductions of ocular pulse tracings.

Wessely writes on the relation between eye tension and the general circulation. He states that the eye tension is not only dependent on the blood circulation, but also on the fullness of the vessels in the eye, the two not always being equal. This would explain the apparent discrepancy between the experiments performed and the clinical examinations made. The elasticity of the vessels has also something to do with the findings. In young children with apparently low blood pressure there is often found a comparatively high tension in the eye, and in old people the reverse.

Wessely finds that in nephritis the small capillaries are narrowed. This heightens the pressure in the large arteries and lowers it in the capillaries and veins. In nephritic cases, therefore, one finds high blood pressure without high eye tension. When the vessels of the eye partake of the dilatation of the vessels of the body a rise of tension goes on, even with the narrowing of the vessels of the body. More experiments and observations are necessary to come to any very sure conclusions.

Magitot and **Bailliart** experimented upon the eyes of animals by making a known pressure upon them and watching the increase of intraocular tension produced. They find that the eyes of most animals normally possess a tension between 15 and 30 mm. of mercury, and pressure upon the globe causes a diminution of about 5 mm., which, however, disappears very quickly. This phenomena is not produced in eyes having a tension of less than 10 mm., and is exaggerated when the tension is artifically raised above 30 mm. They find that the tension can thus be modified by the natural pressure of the lids or the contraction of the ocular muscles; the slightest traction on the nictitating membrane provokes a rise of tension of 10 or 15 mm. The ocular tension is never absolutely fixed in an animal, but varies between extremes of 15 to 28 mm. This they find true of all mammals from the guinea pig to the horse. **Montaño** has described the methods of Magitot and Bailliart for estimating blood pressure. (See O. Y. B., v. 15, p. 110.)

Alcorta observed a case in which following traumatic cataract and an artificial pupil a delicate membrane remained separating the anterior and posterior chambers. From observation of this eye Alcorta concludes that there is a state of equilibrium between pressure in the anterior and posterior chambers. The effort of accommodation or the effect of eserin produces a greater pressure in the anterior chamber, while atropin, on the contrary, causes the greater pressure in the posterior chamber.

Kothary contributes a general paper on glaucoma and **Kearney** deals with the importance of the early detection of glaucoma.

Tonometry.—The communication on tonometric values by **Smith** is a critical study of tonometry with reference to the accuracy of the Schiötz and McLean tonometers. He summarized the paper as follows: The Schiötz tonometer measures the impressibility of the eyeball and can indicate changes of intra-ocular pressure in a given eye with great certainty.

The tonometer cannot measure the intra-ocular pressure with precision, because the relation of the impressibility of the eye to the intra-ocular pressure is different in different eyes. In other words, exact mercury equivalents for the degrees indicated by the pointer cannot be given.

Approximate mercury equivalents are found by testing a number of human eyes with the tonometer and a manometer almost simultaneously. It is not possible, however, to carry out the test under conditions quite like those under which the tonometer is ordinarily used. Equivalents found by experimenting on animal eyes are likely to be incorrect for human eyes.

The value of any new tonometer will depend not merely on the excellency of its mechanism, but also, and essentially, on the tests by which it is regulated.

The Schiötz curves are not likely to be precisely correct, even for the average living eye, for the reasons just given. They are necessarily sometimes at fault for the individual eye. On the other hand, it is not proved, and it is not likely, that the instrument errs to the extent that **McLean's** experiments suggest. **Elliot** writes on tonometric values and speaks highly of the McLean instrument.

Hydrophthalmos.—A case in which one eye had been enormously hydrophthalmic since birth is reported by **Seefelder.** On examining the other eye there was every indication of a megalocornea, but the posterior segment of the eye was the usual size. He contends that, judging from the appearances in this case, the failure of corneal inflammation, no rupture of Descemet's membrane, the normal size of the limbus, in spite of the enormous width of the anterior segment of the eye, the sharply outlined corneo-scleral margin, the normal appearance of the sclera in spite of its unusual development, the failure of a glaucomatous excavation, the good vision, the regular astigmatism, the normal tension, that the large **eye was not truly** hydrophthalmic, but simply a form of giantism without the factor of stretching entering into the developmental anomaly. He suggests the name "giantophthalmus" to express the condition. He mentions numerous cases of supposed hydrophthalmos in which good vision was retained, and is doubtful of the diagnosis in these cases.

Goldenburg showed a case of buphthalmos. The child gave a history of ophthalmia neonatorum which cleared up in six weeks when the hydrophthalmos was observed. **Harlan** reported a case of buphthalmos following interstitial keratitis.

McCaw presented a case of megalocornea in a man 67 years of age. He had double cataracts and the fundus was obscured. The corneas measured fully 15 mm. in diameter. They were extremely thin, and when the lens was removed from the left eye the cornea collapsed and was devoid of any tissue resiliency. The enlargement was entirely in the cornea, the posterior segment of the eyeball was not enlarged. There was neither history nor symptoms of glaucoma.

Peter showed a child of 17 months with buphthalmos, on which he performed posterior sclerotomy with good results. The operation was repeated every two months until he had performed four on each eye. After each operation the cornea cleared somewhat, but there was a tendency to relapse. An iridectomy was performed with practical relief of lateral nystagmus. The child is now able to see fairly small objects. He considers the results of this method satisfactory up to the present time. The corneal opacities were decidedly lessened after each posterior sclerotomy. The tension of the eyeballs was held at about 25 mm. The optical iridectomies have decidedly improved central visual acuity and practically removed the nystagmus, which was rapidly developing. Zentmayer in discussion pointed out that operative procedures in these cases to be of value must be done early.

Vogt presented at the Society of Swiss Ophthalmologists three rabbits suffering from hereditary hydrophthalmos. The observations of **Gunnufsen** upon the intraocular tension during sleep have been previously noticed (O. Y. B., v. 14, p. 81).

Zeeman has performed cyclodialysis eleven times in five children with buphthalmos. The first case was a successful one, but the results in the second and third children were far less satisfactory, in spite of the fact that the operation was repeated in both eyes after a short but passing success. Each of these children had important decompensation phenomena since birth—that is, more than two years. In a fourth child the cyclodialysis made the cornea in the one eye clear and smooth, but a trephining of the sclera was necessary in the other eye on account of no improvement. In a fifth patient, where a trephining was done in the one eye with complete success, the other eye became decompensated in spite of two trephinings. A cyclodialysis produced at the end the wished-for success. As far as clinically could be shown, no damage was done by the operations.

Zeeman performed trephining eleven times in seven children with buphthalmos. In three children the operation was done on both eyes; in the other four on one eye. Vitreous prolapse occurred twice during the operation. One was in a very large entirely blind eye where ultimately it led to a slight decrease in the size of the globe. This was due to too much handling in making the toilet.

Etiology and Pathogenesis.—In the case of a woman of 48 reported by **Desai,** glaucoma followed the use of homatropin, although eserin had been instilled in both eyes immediately after the mydriasis had been produced; 1 per cent solution being used of each drug. Trephining done ten days after the attack relieved the increased tension, but did not fully restore vision.

The tendency of syphilis to cause glaucoma is illustrated by three cases reported by **Aboudy.** Glaucoma arising from gummatous iritis is reported by **Menacho.** Discussing the etiologic factors of glaucoma, **Pava** takes up the question of its connection with malaria. He finds that paludism may cause glaucoma as general diseases or inflammation may cause it, and usually through uveitis.

Bordeaux reports primary acute glaucoma following subluxation of the lens in a highly myopic eye. Scleral puncture followed by extraction with iridectomy gave a very satisfactory result. **Pichler** reports a case of glaucoma arising in battle. **Smith** has written a general paper on the etiology of glaucoma.

Elschnig reviews the literature relating to anterior synechiae of the lens and glaucoma, and reports a case in which the adhesions followed keratitis. Iridectomy was done and subsequently a cyclodialysis.

Koeppe mentions the previous work of **Levinsohn** rather extensively in an article on the early diagnosis of glaucoma by the Gullstrand Nernst lamp. The most significant appearance by this means is the accumulation of pigment in the angle of the anterior chamber, clogging the Fontana space and Schlemm's canal. Where these appearances are found in a normal eye, the author is in favor of calling the case one of "preglaucoma." He has had eight cases under observation in which the preglaucomatous condition later became glaucomatous.

He says that although the blocking of the lymph spaces would tend to make the anterior chamber deeper, the greater pressure of the posterior segment of the eye counteracts this. A widening and enlargement of the vessels in the posterior segment of the eye usually occurs along with the pigment deposit. He attempts to explain the presence of the free pigment by a congenital weakness in this direction, and as a possible theory mentions the cases of depigmentation of the iris in cases of lesions of the cervical sympathetic which he has observed, deducing the possibility that the deposit of pigment is a nervous manifestation. During the last year he has perfected three original attachments for the Gullstrand Nernst lamp which he uses in connection with his work.

Pigment in Fontana's Space.—**Hanssen** reported the histologic findings in two glaucomatous eyes. The first was in a patient in whom trephining had given relief from pain and intercurrent disease. The most striking characteristics were a free angle in the anterior chamber with rupture of the periphery of the lens, allowing the escape of lens substance which lodged in front and back of the ciliary body. Where the root of the iris had not been completely removed it was adherent to the posterior surface of the cornea. The second eye was from a case of long-standing untreated glaucoma, which became acute shortly before death. The iris and other structure showed a very decided vascularization and areas of chronic inflammation. There was ectropium of the pupillary margin, causing the pigmentary layer of the iris to show very plainly. Free pigment and free pigment cells were deposited in the angle of the anterior chamber.

Schönfeld's paper treats of Fischer's edema theory and his application of it to glaucoma. Her conclusion is, even if Fischer was unable to prove that glaucoma begins with swelling, his observation regarding the acid swelling of eyes is correct in the main, and it cannot be excluded that among the primary causes of glaucoma and of many glaucomatous attacks the swelling, through abnormal acid formation, plays an important part. It is interesting in this connection to note the work of Grünhagen and Pantz, who demonstrated paralactic acid physiologically in the ocular fluids.

Angioneurotic Edema and Glaucoma.—A case of glaucoma associated with angioneurotic edema is reported by **Barkan.** The glaucoma in its acute manifestations occurred synchronously with the edema and disappeared with the latter's disappearance or shortly afterwards, never lasting more than a few hours. It has occurred in this fashion for seven years and has left no deleterious results, never lasting long enough to cause anatomic impairment. Barkan considers his case with reference to Martin Fischer's colloidal theory of the etiology of glaucoma. He concludes that this case only apparently confirms Fischer's views, and in reality is the exception that proves the rule. Angioneurotic edema is fairly common, but his is the only recorded case in which it was associated with glaucoma. Is the excretion of acid bodies altered during attacks of angioneurotic edema? Miller and Pepper found that they were not. Smith found acidosis among his glaucoma patients came within the limits of the normal.

Glaucoma After Trauma.—In a controversial paper, **Schindhelm** briefly reports forty-eight individual cases in which acute or subacute glaucoma was caused by contusion injury to the eye. Thirteen cases were cured by iridectomy, with good visual results; sixteen cases cleared up under the usual myotics, and five eyes were either eventually blinded by cataract or sclerosis, or had to be enucleated. Two successful paracenteses of the anterior chamber were done, and two sclerotomies.

In making a critical study of the cases Schindhelm concludes that glaucoma and trauma coexist only as there is a predisposition to glaucoma, or else the trauma brings to light a latent glaucoma. He states that the two conditions together are not so common as a favorable study of the cases would seem to indicate. A very complete bibliography follows.

Peters, in discussing the controversy between Schindhelm and Deutschmann as to the incidence of glaucoma with trauma, champions Schindhelm in his contention that trauma is not directly the cause of so-called traumatic acute or subacute glaucoma, but that the glaucomatous predisposition must have existed before the trauma.

Glaucoma and Herpes Zoster.—The association of herpes and glaucoma is interesting. Acute glaucoma complicating an attack of herpes zoster ophthalmicus is reported by **Veasey.** The corneal picture was that usually found in herpes; there was marked pericorneal injection and the tension was 35 mm. by Schiötz. The patient's appearance was indicative of severe pain. Knapp, in discussion, had observed a case that explained the condition as a variety of cyclitis. A woman of 55 years developed tension after herpes zoster of 55 to 60 mm. Under the use of pilocarpin the tension was reduced and three corneal deposits were discovered during the following weeks. This shows that increased tension from herpes is merely cyclitis, due to the same toxic organism as the herpes. De Schweinitz, Verhoeff, Greenwood, Clark, Lamb, Parker, Woods and Weeks, joining in discussion, reported similar cases from their practice. The practical point in the discussion was that for hypertension, related to cyclitis or iridocyclitis, mydriatics were indicated in the treatment.

Influenza and Glaucoma. — Orcutt found that the majority of the cases of glaucoma that he had seen during the past year had given a history of having the Spanish influenza. In discussion, Mann compared the cases of glaucoma admitted to the Illinois Charitable Eye and Ear Infirmary during the months beginning September 1, 1918, and ending March 31, 1919, with those admitted during the corresponding seven months of the three preceding years, finding a great increase in acute glaucoma. (Grouping simple chronic and chronic inflammatory under one head as chronic glaucoma); 1915–16, 14 per cent of the cases of glaucoma were acute; 1916–17, 26 per cent were acute; 1917–18, 20 per cent were acute; 1918–19, 60 per cent were acute.

During the past seven months there were thirteen cases of acute glaucoma. Of the thirteen acute cases, eight gave a history of Spanish influenza preceding the attack, one followed an attack of erysipelas, another was diabetic, and still another had a late secondary syphilis and a +4 Wassermann.

Schipfer reported the case of a woman 55 years of age who one month after influenza had developed glaucoma. Both pupils were inactive to light; vision was almost nil in right and 20/200 in the left. The color fields were very much reduced.

The Pupil in Glaucoma.—In support of his theory of the primary reaction of the pupil (O. Y. B., v. 15, p. 55), **Dunn** discusses the pupil in glaucoma, calling attention to a condition he has not found mentioned in the literature. The eye was able to see light, and light thrown in it caused the consensual pupillary reaction in the other eye. But there was no primary reaction of the iris to light, although the pupil of this eye reacted with convergence and accommodation. In the case he reports following the acute attack the pupil had become immobile, but after a broad iridectomy, tension becoming normal, the cupping of the disc being very slight, the pupil began to contract consensually and with convergence and accommodation. He supposes the pressure on the root of the iris and stretching of the sphincter for the time abolished all pupillary movements. But when the motor apparatus recovered, following the reduction of tension, the other movements returned, but the primary reaction to light thrown into that eye remained absent. He accounts for this with the theory that this reaction is dependent on a function of the retinal pigment layer, the circuit involved being responsive ganglion cells in the retina and also retinal pigment cells connected by an afferent apparatus with a ciliary ganglion. The motor connection of the ciliary ganglion and iris sphincter completing the circuit. Dunn believes that the destruction of the retinal pigment cells interrupts this primary reflex. This condition he believes occurs in the late history of simple chronic glaucoma.

Scotomas in Glaucoma.—The light and color sense in chronic glaucoma have been studied by **Delorme**, particularly in cases of paracentral and central scotoma. He finds that the diminution of differential light sense depends strictly on the ocular tension and its relief by miotics is prognostically favorable. This applies to all portions of the retina. There is no important distinction in this respect between the macular region and the paracentral retina.

Glaucoma Simplex.—A case of glaucoma simplex of both eyes in a man 53 years old is reported by **Stilwill** and **Black**. The pupils were dilated and sluggish, the tension in each of the eyes was 55 mm. Schiötz' tonometer. There was cupping of both discs, more marked in the right. Eserin held both eyes for a time, then both eyes began to fail and a sclerocorneal trephine with iridectomy operation was performed by Black in the left eye. The vision before operation was L. 4/20; after operation 2/60. The anterior chamber had remained completely empty for about a month after operation, and then gradually refilled. Atropia was used during this time. The tension gradually rose to 17 mm. The cup after operation was unchanged.

In discussion, Jackson pointed out that the field, taken before operation, indicated that the boundary was cutting pretty close to the fixation point. The boundary was probably closer to the fixation point than the chart would show. It frequently happens that operations on such eyes are followed by further limitation of the field of vision, which carries it beyond the fixation point. The operation is not to be blamed on that account, but this is one of the risks which have to be taken in operating on such an eye. The best operation for the other eye might be a Lagrange, with a large iridectomy. Walker would do an iridectomy and the scleral puncture after the method of Priestly Smith. **Köllner** has written on the tension in glaucoma simplex.

Irvine reports an unusual case of glaucoma in a boy of 9 years which does not conform wholly to this or any of the types he has been able to find in the literature in so young a person. A Lagrange operation was done on each eye a week apart. The patient retains vision in L. with lowered tension three and a half years afterward. The author feels justified in concluding that infection and toxemia from Bright's disease and a lingering typhoid fever, with focal infection of the teeth, tonsils and sinuses brought about the eye condition. **Pischel** reports a case of simple glaucoma in a woman, aged 68, in which he did the Lagrange operation with basal iridectomy in the right eye, followed nine months later with an Elliot trephining. The eye has remained soft since, and the sight remains 5/30.

Non-Operative Treatment of Glaucoma.—From thirty-two years' active practice of ophthalmology, **Weeks** gives his personal observations regarding the treatment of glaucoma. For many years he has made it a routine practice, when time and circumstances permit, to try the effect of miotics in all cases of glaucoma before advising operation. The miotics employed are pilocarpin and physostigmin salicylate, the former in 1/3 to 2 per cent; the latter from ¼ to 1 per cent. As adjuvants, jaborandi is used internally, opium at times, and free catharsis. The pilocarpin and eserin are usually dispensed in a 3 per cent solution of boric acid to avoid rapid deterioration. Pilocarpin from 1/3 to 1 per cent is prescribed as a preventative in many cases in which the tension is at or near the upper limit of normal, in which the anterior chamber is shallow and where there is even slight cupping of the whole or a portion of the disc.

A diminution in the field of vision for form or colors, with or without enlargement of the blind spot, is an urgent sign for operative interference.

In the acute cases local treatment is used; eserin salicylate, 1 per cent every hour; if tolerated, a calomel purge; morphin hypodermically, and a light diet. If after twelve hours there is no diminution in the tension, operation is performed. If the tension is subsiding, operation is postponed until the eye has become as nearly normal as possible, when a broad iridectomy is performed.

For the subacute and simple chronic cases of glaucoma, Weeks prefers the Lagrange operation. The trephine he limits to buphthalmos cases and those cases with deep anterior chamber, and to cases of simple chronic glaucoma, mostly with relatively low hypertension. Following the Lagrange operation, massage is employed, beginning forty-eight hours after the operation.

Knapp presented the case of a girl 12 years of age with 7 D. of myopia. She was first seen in the fall of 1917, vision being R. 20/200, L. 20/100. The pupils are a little eccentric. The depth of the anterior chamber was not uniform, with a slight tremulousness of the iris, suggesting a subluxation of the lens. The fields were contracted to 10 degrees.

The optic nerves were cupped, with pronounced atrophy. Tension from 60–70 mm. Hg. The right eye was lost following operation. The left eye was treated with drops. The tension in January, 1918, was 36 mm. and gradually went down until in November, 1918, it was 13 mm., at which it has remained. The vision at present time, with correction, is 20/200. The anterior chamber is shallow. There is no cupping of the nerve, but it is very white. The case is of interest as showing a glaucoma which apparently was secondary to a partial subluxation of the lens, and that these eyes do not stand operation well; and further, by leaving them alone or by means of drops, the tension may be satisfactorily reduced.

Glaucoma Operations.—Müller presented a patient who had had total leukoma in the right eye and absolute glaucoma in the left. By a remarkably fortunate operation he was able to transplant the clear cornea of the glaucomatous eye to that of the leukomic eye with visual results of 6/36. The glaucomatous eye received the opaque cornea. The scar forms a heavy white ring around the edge of the cornea, but the man is able to go about, even at night.

In a lengthy monograph on the operative treatment of primary glaucoma, **Gunnufsen** reviews the historic aspects as follows: The interval between the first iridectomy by Graefe and the sclerectomy by Lagrange consists of fifty years of epoch-making history in the science of ophthalmic surgery.

The simple iridectomy of Graefe was first modified by Bader by the formation of a staphyloma of the conjunctiva. The Quaglino and de Wecker sclerotomy have not yet lost their value. Herbert's subconjunctival formation of a fistula in 1900 was of great theoretic and practical interest. Holth followed with his iridocleisis, and the latest, Lagrange's subconjunctival sclerotomy seems to be the masterpiece. Schiötz' tonometer in 1904 is of the greatest help.

Gunnufsen's material consists of 940 primarily affected eyes on which 682 operations were performed; 130 cases of iridectomy, 127 iridocleises antiglaucomatosa, 167 sclerecto-iridectomies, 247 trepanations and in 9 cases a sclerotomy anterior after de Wecker. He summarizes the cases in tables and gives the following general conclusions:

The earlier primary glaucoma comes to operation, the better the results to be expected. Iridectomy is not the only operation to be chosen. In acute glaucoma and for advanced glaucoma simplex, Holth's iridocleisis antiglaucoma seems to be the best operation. Sclerectoiridectomy has given very good results with good function in glaucoma simplex. By using Elliot's technic we have been able to get a somewhat higher per cent of good tension than by the use of Holth's operation. Trepanation is technically much more difficult; there are more cases of iritis and late infection and more often a pigmentation of the anterior lens capsule. In Elliot's operation there seems to be a larger percentage of traumatic cataract. Glaucoma absolutum should not be operated on, but when the pain gets too great, Elliot's trepanation can be used. The author illustrates his article with six excellent illustrations and a bibliography.

Santos Fernandez, while admitting that glaucoma operations can be done without subconjunctival injections of cocain, holds that these aid in rendering the operation a success. He also gives a small dose of morphia hypodermically one-half hour before and repeats it at the close of the operation.

In a case of acute glaucoma complicated by dacryocystitis Santos Fernandez gave chloroform and operated on the lacrimal sac. The focus of infection was destroyed by the thermocautery. Then iridectomy was done for glaucoma without special risk and with excellent results. In describing the technic of iridectomy as he performs it, **Wieden** lays stress on the conjunctival flap as a means of preventing sepsis. **Stieren** has written on iridotasis in glaucoma.

Sachs has used both the subconjunctival iridectomy and the Elliot trepanation. He considers Elliot's operation the simpler method.

Herbert has returned to the iris prolapse operation in glaucoma, especially in advanced cases. An incision was made by puncture and counter-puncture with a 1 mm. Graefe knife. The incision was entirely subconjunctival.

The rôle of the sclera in the etiology and treatment of glaucoma has been discussed by **Bourgeois.** He classifies the different methods of relaxing it as 1, simple paracentesis; 2, capillary drainage of the anterior chamber; 3, iridectomy; and 4, sclerectomy, the most permanent.

Iridectomy.—In discussing the relation of scotomas to the choice of operation in glaucoma, **Schoute** points out that iridectomy was thought dangerous when the field of vision has shrunk from the periphery toward the center. However, from four cases successfully operated on, he concludes it can be carried out successfully, even in these cases, without destruction of central vision. He thinks that trepanation can be done without danger of shrinkage of the field; that a Bjerrum scotoma is not a contraindication for either operation, and concludes that both operations are equally safe with regard to preservation of the field. **Sobhy** reports a case in which trephining gave a good result, although the field of vision was contracted almost to the fixation point.

Jackson showed a man of 65 years upon both of whose eyes an iridectomy had been done for glaucoma by E. V. L.

Brown of Chicago. Before the operation vision had been failing rapidly, and each disc was cupped 5 or 6 diopters. Eight months after the operation the eyes were quiet, tension R. 28 mm.; L. 20 mm., and vision was improving slightly.

Terson reports on a case in which a bilateral iridectomy had been performed. The beneficial results obtained, however, were only temporary, and he later performed a T-shaped equatorial sclerotomy on both eyes with resulting vision of R. 0.1, L. 0.2. The tension became normal and other symptoms disappeared. This result has remained permanent. Pilocarpin has been used every other day as a precautionary measure. A brief discussion of sclerectomy in glaucoma is given.

Sclerectomy and Trephining.—What is called a double sclerectomy by **Young** is a double trephining, done with a 1 mm. trephine strictly in the sclera, preferable at the lower edge of the cornea. A semicircular conjunctival flap is made with its base tangent to the lower margin of the cornea; and under this the trephine openings are made 2 or 3 mm. on either side of the vertical meridian. The sclera alone is removed, including a dull cobweb-like coating, exposing the shiny, deep black uveal coat. In the first opening this prolapses, but when the second opening is made the prolapse retires from the first, and none appears in the second opening. The conjunctival flap is then restored to position and retained by three sutures. Among twelve cases thus treated, one eye had been lost; the others had all been successful. **Colombo** holds it important to the success of trephining that some involvement of uveal tissue be secured, although this may be minute and invisible. He bases this view on experiments upon rabbits' eyes and their study microscopically, with notes of uveal involvement in human eyes which had not been suspected clinically.

Lloyd reports a case of cataract extraction by the Smith-Fisher intracapsular method sclerotomy and a corneoscleral trephine above without achieving a good result. There was a bulging of the wound above, and a bead of vitreous. A second trephining with iridectomy was performed below with an excellent result. He concludes that the trephine opening should be made where the iris can hold back the vitreous which is thrust forward.

Lister's article gives the results of his experience with the trephine operation. There are a number of refinements of technique which have impressed themselves upon him. Among these he mentions his method of dissecting the flap with the blunt end of the scissors, and how the eye was fixed by fixation forceps; one held by the assistant below the center of the cornea and one held by himself at the outer border of the flap. After the iris is cut and the disc removed he pauses until all blood has disappeared, before closing the flap.

Woodruff's communication deals with "the local treatment of chronic simple glaucoma." For this type of glaucoma he does not have much confidence in miotics, but if he uses them he follows the method of Posey. He has become convinced that the trephine operation, carried out with proper technique, is the best drainage operation for this group of cases. He modifies the Elliot technique by using de Wecker scissors to cut the iris, and removes the disc with the Stephenson punch. He closes the flap with a continuous suture.

Van Duyse has written on trephining for glaucoma.

Uribe-Troncoso, in following a review of Ewing's case of acute glaucoma on which a postciliary scleral trephining was done, draws the following conclusions: That scleral trephining as an operation for the relief of subacute glaucoma is entirely useless, because the wound is rapidly closed by newly formed fibrous tissue. The cloudiness of the cornea and vitreous and the arterial pulsation can be instantly relieved by drainage from the vitreous, with immediate restoration of sight. The loss of vitreous even in such quantity as to leave the eye very soft, is no more cure for glaucoma than is the removal of the lens. A drainage of the aqueous can be established from the anterior part of the eye through the vitreous and below the conjunctiva. The interesting thing about this case is the fact that glaucomatous symptoms were always produced when the aqueous accumulated in the eye, notwithstanding the small quantity of vitreous left. This proves that in glaucoma the secretion of the aqueous is not stopped, even when the intraocular pressure is very high and also that when the anterior outlet is closed it accumulates in the vitreous sponge and equalizes the pressure all over the eye, escaping freely when an artificial outlet is produced either forward or behind the equator.

With many allusions to the literature of the subject, **Deutschmann** reports his experience with trephining and sclerectomy. His first case of the Lagrange operation did badly. He therefore devised a form of sclerectomy which he performed in fifty-four cases. Raising a conjunctival flap 6 or 8 mm. from the limbus and making an angular incision in the sclera with a lance knife. Of forty-four such operations done for simple glaucoma, forty-one were done without iridectomy, but in only four of them did the tension remain below 25 mm. (Schiötz). Of the three eyes in which iridectomy was done, one did well, and of three operated on for deep glaucoma with iridectomy, all did well. The operation was, however, given up for "trephining after Elliot," which Deutschmann had done 178 times on 166 eyes, of which 156 were glaucomatous. The iris was excised in 109. The excision included the sphincter in thirty-six, and these gave the largest proportion of filtering scars. Iris incarceration occurred in eight cases, vitreous prolapse in seven and failure to remove the trephined disc in five. In the latter the disc disappeared by absorption in from one to two weeks or longer. Deutschmann has also experimented with sclerectomy and trephining in the production of choked disc.

A case is reported by **Aboudy** in which incision of the ciliary body was done for violent hemorrhagic glaucoma in a diabetic patient, giving relief and avoiding the necessity for enucleation.

Knapp reported in abstract four cases in which hypotony followed trephining for glaucoma. The operation performed in these cases was the usual one following the directions laid down by Elliot. A choroidal detachment was observed in three of the cases. The ocular tension measured in these six eyes at a period varying from four to six years after operation: 2, 5, 10, 4, 8 and 8 mm. Hg. In three of these, namely, those measuring 10, 4 and 8, there is no loss of sight or ocular changes. In one eye with a tension of 2 mm., the eye was lost from phthisis bulbi. In one with a tension of 6 there was a mature cataract with normal light projection, and in one with tension of 8 a posterior cortical cataract is developing. In view of these results Knapp is not in agreement with the view that prolonged hypotony is harmless. He considers too free filtration is as much to be avoided as none at all; and that hypotony and late infection are real dangers to the trephined eye. He considers a smaller trephine, cleanly removing the entire disc the best procedure.

Following trephining for buphthalmos on an 8-year-old boy, the result was complicated by retinal detachment. **Zeeman** thinks that the operation should only be considered in very young children, and that the menacing retinal detachment alone is reason to desist from operation in older children. He followed Straub's modified location of the connective tissue flap, parallel with and high above the corneal margin. His second modification was to prepare a thick conjunctival flap up to about 1.5 mm. above the corneal margin, and then a thin scleral flap until the corneal tissue shines through. The conjunctival flap is thus strengthened with a thin scleral flap. Straub considered this modification afforded great protection from late infection.

Bourgeois, to maintain fistulization, touches lightly the circumference of the orifice of trepanation with a very fine thermo-cautery point of somber red, after conjunctival recovery, as a final step. The eye well supports this intervention and the results are encouraging.

Late Infection.—Purtscher expatiates on the iridectomy for glaucoma by means of a covered trepanation opening. He claims that the danger of late infection is less. He describes the operation. **Meller** having previously reported three cases of Elliot's trephining now adds one which occurred four years after the operation. The patient remained under observation about three years longer, the ultimate result being light perception and projection in a limited part of the field with tension minus 2.

Zaki Seddik having previously reported a case of late infection now adds two others following a trephine operation. In one the trephine opening had been made below; panophthalmitis occurred about six months after the operation. In the other case the eye had been operated on four years before; the left with absolute glaucoma remained quiet, the right, her only seeing eye, was infected with pus under the bleb, nebulous cornea and small hypopyon. Smears from the conjunctiva were negative, but pus evacuated from the bleb swarmed with Morax-Axenfeld bacilli. The patient was suffering from ozena and a smear from the nose showed the same organism. Zinc drops, subconjunctival injection of Hg. Cy., 1 to 5,000, and zinc ointment in the nostrils saved the eye with V = 3/60.

Crigler reports a case of late infection after trephining for buphthalmos, and **Dubois** has written on the subject.

Cyclodialysis.—A very interesting paper on cyclodialysis has been written by **Gradle**. The history of the operation and its technic are given, its rationale and the proper selection of cases. Under the latter heading he quotes Heine: "The more acute the glaucoma the more urgent the indications for immediate operation, the better will be the results of iridectomy; the more chronic the glaucoma and the less urgent the indications for immediate operation the more favorable will be the results of cyclodialysis." In these brief sentences Heine gives the indications for and the contraindications for this operation.

Gradle's conclusions are: (1) Cyclodialysis is an operation that decreases increased intraocular tension by freeing the angle of the anterior chamber of adhesions; (2) the particular indications for the use of cyclodialysis lie in the essential chronicity and freedom from inflammatory reaction of the disease; (3) cyclodialysis is distinctly contraindicated in acute glaucoma, in glaucoma of an exudative or inflammatory type, and in cases where an immediate operation is desirable; (4) the effects of a cyclodialysis must be judged by the behavior of the central vision, the visual fields and the intraocular tension; (5) in about 50 per cent of the cases with proper indications cyclodialysis is successful; in about 20 per cent of such cases it produces temporary results that usually become permanent by a second or even a third operation; in about 30 per cent it is a failure.

A case of subacute glaucoma was reported by **de Schweinitz**. The tension was above 60 mm., the cornea was steamy, and there was a persistent conjunctivitis which yielded a pure culture of staphylococcus. Miotics reduced the ocular tension but did not control it. After a thorough cleansing of the conjunctival sac a cyclodialysis was performed and the scleral incision cauterized with carbolic acid. There was no reaction of any consequence. The anterior chamber was deepened. Miotics were continued, and at the time the patient was exhibited, nearly five months after the operation, the corrected vision was 6/9, the field had markedly widened, and the tension as measured with the Schiötz tonometer was 18 mm.

The procedure was followed in a second case somewhat similar to the previous one. De Schweinitz suggested that cyclodialysis in cases of practical obliteration of the anterior chamber and very high tension should prove to be a useful procedure, preparatory to a more formal operation, in place of a posterior sclerotomy. Zentmayer in discussion reported performing this operation in a series of cases with uniform good results. He limited the procedure to the preservation of sightless glaucomatous eyes and for secondary glaucoma, with marked sclerosis of the vessels, as in retinal hemorrhages and thrombosis of the central vein.

The Crystalline Lens

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This review of the subject carries the literature from April, 1919, to May, 1920. For previous references see A. J. O., v. 2, 1919, June, p. 118, and July, p. 129.

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DIGEST OF THE LITERATURE.

Embryology and Development.—In a carefully written article, profusely illustrated with plates and microscopic photographs, **Lane** treats of persistent posterior fibro-vascular sheath of the lens. The article reports two clinical cases and three eyeballs examined microscopically. After calling attention to Collins' paper, published in 1892, the author discusses the unsatisfactory theories of embryologists. The microscopic findings of the three laboratory specimens are quoted in detail. The author concludes:

1. Assuming that the existing condition of the two clinical cases is congenital, it is certain that had they been examined during infancy or early childhood, the question of glioma would have been considered.

2. An opaque, vascular tissue behind the lens, whether completely or incompletely surrounding the posterior capsule in eyes presenting evident congenital anomalies should strongly suggest the possibility of a persistent posterior fibro-vascular sheath of the lens.

3. Pigment, particularly in the posterior portion of the lens, and a postlental vascular membrane, suggest a congenital defect of the posterior capsule and hemorrhage in the lens material.

Grahn endeavors to give the following significance to facts which he accurately describes: The embryonal lens has at first a very great size; later it becomes smaller and smaller until it assumes its normal size. This happens through the disintegration of a mass or number of fibres, the disintegration products of which are carried away by the blood vessels of the vascular tunic of the lens by means of the cooperation of the phagocyte action of the leukocytes. Or else one can assume that the provisional structure of the lens is replaced in this way by its definitive structure, just as this process occurs in other organs.

Anatomy and Structure.—A case of radiating lens opacities in a woman, aged 40, was presented by **Neeper.** She had been seen twelve years previous with 20/20 vision. One year previous the vision had fallen to 20/50. Jackson, in discussion, called attention to the similarity of arrangement of so-called blue cataract. Neeper also described a dense cataract occurring in a patient of 66 with doubtful light perception, and Jackson, in discussion, brought out the fact that it was possible to have a cataract which cut out light perception completely, and yet good results follow extraction.

When the lens is viewed with transmitted light, according to **van der Hoeve,** the irregular particles which can be seen indicate, as does the fluorescence, that the lens is a heterogeneous structure. This optical condition causes the incident rays to be refracted unequally. This may account for the blue colorblindness present in some old persons.

Chemical Compositions.—Under conditions similar and working with the same apparatus used by Priestley Smith, **Maynard** conducted a series of observations on the weight, volume and ash of human lenses. He concludes: 1. A great variation of weight and volume is found in both European and Indian lenses. 2. In Indian cataracts the ash is very small and varies considerably. 3. Cataracts in Indians are on the average lower in weight and greater in volume than in Europeans, despite the heavier physique of the latter. 4. Cataract in the Indian shows steady increase in weight and volume as it ripens and passes into over ripeness. In Europeans, Priestley Smith concluded cataractous lenses were lighter and of smaller bulk than clear lenses.

Hayano has investigated the power of the lens to neutralize alkaline solutions. **Drouet** and **Piet** have also written upon cataract and acidity.

Dispersion of Light by the Lens.—Elaborating a view previously suggested, **van der Hoeve** states that as a result of optical heterogeneity of the lens the rays passing through it are so refracted that the ultraviolet portion produces an unfavorable effect on the ciliary processes. This is especially the case in old age producing the changes in nutrition and secretion of the lens and ultimately leading to cataract.

Lenticonus.—A case of lenticonus occurring in a recruit, age 20, was described by **de Schweinitz** and **Wiener.** Right vision 8/200, left vision 10/200. Each lens presented an anterior cone, which could readily be seen by ordinary daylight, looking through the anterior chamber, and especially from the side. Under mydriasis it was noted that the lenses were small and slightly hazy except in the region of the zonula. Fundus examination, negative. The tip of each cone nearly touched the posterior layer of the cornea. The authors state their belief that only two similar cases have been reported in the literature—one by Webster and the other by Van der Laam. A drawing accompanies the report. Lenticonus posterior has been reported by **v. Jano.** The best correction for compound myopic astigmatism gave V. of only R. 6/36, L. 6/24. The patient was a healthy man of 22 who always had poor sight.

Congenital Coloboma.—Eleven cases of congenital coloboma and lens dislocation have been observed by **Clark,** eight with coloboma and four with congenital dislocation. In one case both coloboma and dislocation were found in the same patient, and in not one of the eleven cases in which coloboma of iris and choroid were observed, were the two conditions associated. The author quotes the life history of two cases in detail and also publishes a chart of the family, showing coloboma and congenital dislocation. He emphasizes the desirability of a careful study of this type over a long period. His experience has led him to the conclusion that in youth the elasticity of the lens is such that in spite of the absence of the zonular fibers over a relatively large sector of the lens, accommodation for that portion of the lens opposite the normal pupil may be satisfactorily accomplished without a marked degree of lenticular astigmatism being apparent, but as the lens gradually becomes rigid with age, an increasing degree of astigmatism of the lens is developed.

Ischreyt, with other congenital malformations, reports a case of coloboma of the lens.

Wing reports a case of congenital aphakia, which was discovered at operation in a child of 6 months, when upon an attempt at needling, supposed congenital cataract, simply a capsule was found which was slit with a large inverted V-shaped incision, resulting in a large black pupil. The patient, now a child of 4 years of age, with a + 7.00 sph. lens, has apparently normal vision.

Congenital Dislocation.—A case of congenital dislocation in a boy of 16, with low vision, was reported by **Schlichter.** Lambert, in discussion, advised discission, quoting successful experience in six similar cases.

Strickler presented four cases of congenital dislocation of the lens in the same family—a mother and three children.

A case of congenital dislocation of the lens was shown by **Shannon.** The left lens had been successfully removed a year previously. The author made four unsuccessful attempts to needle the right lens. Then with eserin he succeeded in keeping the lens in the anterior chamber, and removing it through a keratome incision, which had been enlarged with scissors. The lens was drawn out with a sharp Tyrrell hook. The recovery was uneventful.

In discussion, Lambert reported that he had obtained satisfactory results by operation in six similar cases, and Knapp reported one case in which extraction was successful.

Jackson and **Black** exhibited a calcareous lens which had been removed from the anterior chamber, into which it had apparently migrated after remaining for a long time in the vitreous. The shrunken lens, yellowish-white in color, was removed and the wound healed rapidly.

Knapp presented a case of bilateral dislocation of the lens, situated in the bottom of the vitreous. In R. the lens presented a well-marked central opacity surrounded by a clear transparent ring, with an advanced stage of chorioretinitis pigmentosa. L. was free from either inflammation or pigmentation. In the opinion of the author, the dislocated lens with the clear periphery indicated an advanced stage of hypermature cataract, in which the periphery had again become clear. **Pereyra** has written on spontaneous subluxation of the lens.

Hegner studied sixty-five cases from the Jena collection of cases. He found that in 70 per cent of the cases the age was over 45 years. This he explains by the changes in the elasticity of the fibres of the zonula. Luxation in these cases is less often complicated than luxation in younger people. Only 12 per cent of the cases in people under 45 were uncomplicated.

Hegner concludes that secondary glaucoma is the most dangerous complication of subluxation, as it occurred in 83 per cent of the cases. Myotics or operation are of little therapeutic value. Extraction of subluxated lenses is dangerous, in many cases causing the loss of the eye.

Berger saw an old man whose right lens was sunken into the vitreous where it was freely movable. The anterior chamber was very deep and the pupil was black. With a glass, 5/6 vision was obtained.

While chopping wood a piece had struck the man in the right eye, which was nearly blind. Upon opening the eye after the pain had somewhat subsided, he could suddenly see. Five days later the patient returned and said that he had been chopping wood, and had again been struck in the eye, which was followed by blindness. The lens could be plainly seen in the anterior chamber. The patient, however, refused an operation, and when seen three months later the eye was entirely amaurotic. The lens had again slipped back into the vitreous and the eye was suffering from a severe iridocyclitis.

Congenital Cataract.—After reviewing historically recorded operations for bilateral congenital cataracts, **Salterain** emphasizes what Moreau has pointed out—that the removal of the cataract is merely preliminary to a child's beginning to see; quoting from his own experience, confirms the necessity for continuous intelligent training in use of eyes as indispensable for vision. One backward boy of 6, after training by the Montessori method, was mentally and visually the peer of normal children of his age.

Tuto concludes from an analysis of the literature he has consulted that there is a tendency among ophthalmic surgeons to abandon simple discission in favor of extraction of the lens, limiting the former operation to fluid cataract. The author favors linear extraction. He believes that the disadvantage of increased corneal astigmatism and an iris coloboma, with increased danger from infection incident to two operations, is outweighed by freedom from iris entanglement, vitreous prolapse and increased pupillary space, and he therefore does not favor iridectomy according to Smith's technique.

After a study of the diagnosis of the various forms of congenital cataracts, **Alonso** makes the following division in relation to their surgical treatment: the so-called zonular cataract, the milky liquid, the soft, the membranous and dry silicous. He mentions two cases in his practice: 1. A boy, aged 9, affected with double zonular cataract, more developed in the right eye, on which he practiced extraction of the crystalline lens after discission, having found a large nucleus, hard and of amber hue, which resembled a senile cataract. On the other he practiced an inferior and internal sphincterectomy, with excellent results. This case is analogous to the one published by Panas. 2. A boy 12 years old with a membranous cataract in the right eye, movable iris and good visual projection. The left eye was microphthalmic with rudimentary projection of light. Extraction of membranous cataract on the right followed with excellent result, and Alonso afterward made very interesting observations on the visual psychology of this patient, blind from birth.

Alonso declares himself partial to extraction of congenital cataract, even in cases of liquid milky cataract, this treatment being more surgical and rapid, and concludes that, excepting in certain membranous and dry silicous cataracts, forming by their adhesions a true resistant block with the iris membrane, and certain zonular cataracts in which their small extension and stationary character allow an optical iridectomy to be performed with exit, extraction shall be the choice procedure.

Friede presented a case of unilateral lamellar cataract, which was apparently the result of a wound. When the 12-year boy was 2 years old he had stuck himself in the eye with a fork, whereupon in three days the pupil became gray. In the center of each cornea could be seen superficial scars, plainly the result of eczematous corneal inflammation, and it was not apparent whether the scars of the left cornea were the result of a penetrating wound or not. In the center of the left cornea was a scar which upon illumination showed pigmentation. Adjacent to this in the lens capsule was a white spot which showed small spots of pigmentation within its borders, apparently the wound of the capsule and the cortex. From this stretched a brown thread to the middle of the nasal half of the pupil. In the lens was a grayish-white, slightly thick lamellar cataract of 5 mm. diameter. Illumination with the loupe showed a very delicate additional layer of clouding which had an undulatory edge. As this additional layer was opaque, the opacity in the lens could be seen only by oblique light.

Hereditary and Familial Cataract.—Hereditary cataract in five calves ranging from 4 to 7 months old was reported by **Small.** With the exception of the youngest animal, both eyes presented mature cataracts. The eyes were apparently normal, except the normal tapetum was seen very faintly or not at all. In the matter of heredity, it may be said from the observations thus far carried out, to correspond very closely to the Mendelian theory.

Fleischer concludes that pre-senile cataract appearing between the ages of 25 and 45 years is a frequent symptom of disease. The disease is a markedly familial hereditary affection. Cataract cannot be regarded as due to latent tetany, owing to its difference in form, but likely owes its origin to affection of the glands and of internal secretions. He describes cataract as beginning on the posterior cortex with opacity at the posterior pole with radiating striae. It is followed by complete soft cataract with a small nucleus. There is a large hard nucleus with opacities in the supra nuclear zone similar to that of lamellar cataract. It is regarded as interesting because of its bearing on the etiology of cataract in general, due to changes in the internal secretions.

Pathogenesis of Cataract.—Supplementing his former studies, which showed that the short ultrared waves of our artificial light sources reach the lens and retina in even greater amounts than the visible light, **Vogt** succeeded with the apparatus, which he describes, in producing a total cataract in the intact lens of an adult black rabbit by a three-hour exposure. In a young rabbit, the upper part only of the lens showed opacity, due, supposedly, to the cone of light impinging on this part principally. The opacity was situated partly beneath the capsule, but mainly in the first zone of discontinuity and affected the anterior and the posterior parts of the lens equally. Another pigmented rabbit showed opacity in the anterior upper part of the lens. In albinotic rabbits these effects could not be produced in the time mentioned above. From his findings, Vogt deduces that glassblowers' cataract is due to ultrared and red rays, not, as was formerly assumed, to the ultraviolet rays. He hesitates to draw conclusions as to the etiology of senile cataract from his findings, nor feels able to say that the cataract may not be caused by other than ultrared rays. A further effect of this exposure to this ray mixture is the bleaching of the pigment of the pupillary edge. After a few weeks pigment fell off into the anterior chamber, and there was paralysis of the iris sphincter accompanied by whitening of the hairs of the brow.

Van der Hoeve found during 1914 to 1918, in the Groningen Policlinic among 14,042 patients, of which 1,336 are above the age of 60, in 329 eyes of 173 patients senile macular changes, increasing with age. There was marked lowering of vision, but the striking observation made was that lens opacity was absent, or very slight, if the macular change was pronounced. The author admits an influence of light rich in ultraviolet rays on the appearance of senile lens opacities. He accepts as a cause an affection of the ciliary body, which becomes affected through diffuse dispersion of the lens, which he has demonstrated in 1911. The diffuse dispersion in the lens makes that a part of the incident light, and especially the ultraviolet rays deviate in all directions. The ciliary body becomes affected in its least resistant part, the secreting epithelium.

Wirths adds another case to Purtscher's series of opacity of the lens caused by the presence of copper within the eyeball. In Wirth's case the lens was not directly injured and the opacity appeared two years after the accident. **Salus** discusses the various theories of the origin of senile cataract.

In addition to his other studies on the development of cataract, **Vogt** has made interesting observations concerning the appearances presented by minute opacities when they are viewed by the ultrared rays. He refers to former observations of this kind made by Ogneff, Hertel and others, and then gives his own. His source of light was an arc of about 30 amperes, passing through a filtering glass and then through water, which held a solution of iodin and potassic iodide. With this it was possible to see opacities in the lenses of rabbits, which otherwise were quite invisible.

Vogt gives a description of the "chagreen" found also on the posterior surface of the lens. In 1904 Hess described what he called "chagreen" on the anterior capsule. When that capsule is well illuminated, viewed with the Zeiss corneal microscope, the anterior surface of the capsule appears mottled and irregular. The demonstration of this was easy. In the same way, Vogt carefully illuminates the posterior capsule and magnifying it by means of Gullstrand's "spaltlampe," or slit lamp, he demonstrates a similar appearance on that capsule also.

Handmann reviews the theories of the origin of cataract, as these have been given, on the one hand by Forster, and opposing theories by Magnus, Hess and others. He also summarizes the discussions by Vogt and Hess concerning its origin. The author working with Haubach does not think that the first changes are those which take place near the capsule, but rather from a shrinking of the nucleus. In order to study these earlier manifestations each case was examined under cocain and homatropin with oblique illumination and various modern forms of electric illumination. The author refers to the hereditary tendency so frequently an element in cataract, although he does not go as far as Barth in considering that this factor can be traced in over 90 per cent of the cases. **Hess** has also written on senile cataract.

Cataract From Electric Discharge.—Cataract from a strong electric current is reported by **Kamai.** In the three cases the strength of the current was: In the first case, 11,000 volts; in the second case, 11,000 volts, and in the third case, 3,500 volts. The cataract itself showed in all the cases as a more or less radiating or spotted opacity in the cortical layer.

Unusual Forms of Cataract.—Punctate cataract is the subject of a paper by **Okamura.** In **Weeks'** case cholesterin crystals could be seen in a hypermature cataract when examined by oblique illumination.

Brückner reports an unusual form of secondary cataract following extraction. A woman of 56 sustained an injury of the right eye, the lens of which was removed without accident. Later, although the capsule remained comparatively clear, a veil of pigment cells formed within and around it. This constituted a dark brown structure, in parts almost black. It was quite independent of the iris or ciliary process, lying distinctly behind their level. Later an incision was made in this structure with an iridectomy knife and with proper correction she obtained vision of five-thirtieths.

A case of extraction of black cataract with good result is reported by **Garcia del Mazo.**

Concurrent Conditions.—The relation of the blood serum to the lens albumin has been the subject of an investigation by **Kümmell.** After referring to the remarkable frequency of opacities of the lens among the Mongolians, already observed by others, **Scheer** classifies these forms of cataract according to the age of the individuals. Out of a total of sixty such persons, ten were under 6, thirty-six were between the ages of 8 and 17, fourteen were over 17. The paper is accompanied by fifteen illustrations showing the forms of the opacities, these being as different as the conditions which were seen in the fundus oculi.

Bader thinks corneal tonometry fluctuates between 12.5 and 23 mm. Hg., and becomes less with increasing age. The scleral tonometry fluctuates between 12 and 30 mm. Hg. In youth it is less than the corneal tonometry; the difference is greater the greater the youth of the patient. (5–7 mm. Hg.). Until the fifth decennium the sclerocorneal difference is negative; after that it is positive. This is the result of the rigidity of the sclera from fat and calcium deposits because of increasing age.

Cocain decreases the tension of the eye, and the scleral tonometry is decreased at the same time, not because of a change in the elasticity of the cornea, but because of vasoconstriction of the intraocular vessels. Massage decreases the tension of the eye by expression of the fluid through the lymph vessels, the tension decreases 5–10 mm.

To find out the after results with regard to the tonometry readings, both before and after operation, 230 cataract operations were reviewed. The collapse of the cornea was especially observed. The cases with collapse of the cornea showed the highest differences, from strong vis a tergo to slight (1.5–2.5 mm.). A decrease in the size of the bulb was noted upon loss of the anterior chamber. This is due to the elasticity of the sclerotic, which fails in later life and is most probably the cause of the increased difficulty of delivery of the lens. The pressure from the vitreous back of the lens fails, and the lens does not come forward into the wound as readily.

This makes a practical point. One should make a large conjunctival flap in cases where the collapse of the cornea is expected, in order to prevent the seeping out of material from the conjunctival sac.

Complicated and Peculiar Cataracts.—Successful extraction of an opaque and dislocated lens in a woman, 45 years old, was reported by **Hansell.** Preliminary iridectomy was followed by slight escape of vitreous. The left lens was extracted a few weeks later by means of the wire loop with loss of an insignificant amount of vitreous. Corrected vision was 20/20.

Zentmayer reports a case of spontaneous rupture of the anterior lens capsule with rapid development of cataract. The patient, an epileptic girl of 19, had a perforating ulcer. After dilatation of the pupil with atropin, what first appeared as exudate proved to be lens material protruding from a rent in the anterior capsule. Linear extraction was subsequently done, resulting in 20/100 vision.

Jeremy quotes cataract following experimental thyroidectomy in a dog as recorded by Edmunds. He also reports two cases following thyroidectomy in humans. The author's case was a patient of 50, whose right thyroid was enlarged to about the size of a hen's egg. This condition had appeared seven weeks previously and had grown rapidly. After removal it proved to be giant cell medullary carcinoma. Three or four months after operation vision began to fail. When seen at the clinic the patient appeared myxedematous with frequent spasms. The tetanic spasms were relieved by administration of thyroid extract, but the myxedematous symptoms increased. The author believes that the patient's cataract was due to a toxemia, uncontrolled by sufficient thyroid and parathyroid secretion.

Kafka presented a girl, 20 years old, with uniform disturbance of development. The family history was negative. The patient grew until she was 9 years old, when growth and development stopped. The left eye was cataractous, the sclera blue, cornea small, a staphyloma of the sclera was present and the intraocular tension was high.

Straub's treatise on the inflammation of the eye, caused by resorption of crystalline lens matter in eye lymph, was compiled and published in book form by his former assistants. According to Straub's views, lens matter in solution often causes inflammation of the eye, because of its toxic properties rather than its mechanical influence. Phacogenetic inflammation is the name used for this reaction. Small quantities continually penetrating into the fluids of the eye might exercise slight irritation and set up adhesive inflammation of the angle of the anterior chamber. In young persons the lens matter is less toxic than in the old.

In traumatic cataract the author believes that it is the toxic properties of the lens substance which prolongs the inflammation rather than the direct result of the injury. The immunizing influence produced by suspended lens matter when injected subcutaneously, and the clinical fact that when one lens has been injured and severe inflammation occurs in the eye, and the second lens becomes injured subsequently, the inflammation in the second eye is less than it was in the first eye, are examples set forth to prove his theory.

All membranes of the eye react to the lens toxin and Straub names inflammations due to this agent, endophthalmia phacogenetica. Suspensions of animal or human crystalline lens matter in normal salt solution are of therapeutic value where the eye inflammation is due to phacotoxin. The solution is injected subcutaneously.

A case of traumatic cataract was reported by **Nagel**. A girl of 4 years was struck in the left eye with a thistle head which was immediately removed. After sixteen days a small corneal opacity was noted and the upper half of the lens was opaque. The intraocular tension increased and a simple linear extraction was done.

Koller successfully extracted a cataract from an eye with megalocornea.

Purtscher reports the case of a man 54 years old with a central choroiditis with changes in the vicinity of the macula. By ordinary illumination, the lens seemed comparatively clear. But viewed with the Zeiss binocular white spots (schollen) were discovered in the lens. These were considered due to precipitate, which had occurred in it, and as a result of the earlier pathologic process.

McKellar reported three cases of traumatic cataract in which absorption took place without operation.

Diagnosis.— Observing the normal eye by transillumination, **Esser** noticed that the red reflex appearing to the observer, makes a small clear ring-like zone on the lens directly opposite the iris. It is the same kind of appearance that one might observe in beginning cataract, and immediately suggests that condition. However, there are no grounds for supposing that the shadow arises in this way, as all the eyes examined were entirely free from any suggestion of beginning cataract. The phenomenon is due to part of the light being reflected from the surface of the iris back onto the surface of the lens. The size of the circle is directly proportional to the size of the pupil. His purpose in reporting it is to warn against false diagnoses arising from observation of the shadow.

The new slit lamp of Gullstrand's has evidently thrown light on forms of cataract heretofore obscure. **Vogt's** article, of nearly thirty pages, treats of the obscure forms in considerable detail. It opens with a historical sketch of the diagnosis of these incipient forms, giving an excellent digest of the literature up to the present. He then considers the typical picture of cataract in the incipient stage, when that is complicated with iridochoroiditis, retinitis pigmentosa and similar conditions. These observations were made with Gullstrand's lamp and with the corneal microscope giving a magnification of 24 to 37 diameters.

Illustrations are given of these opacities as they exist in the very earliest stages. The hair-like opacities of some of the fibres of the lens are particularly interesting. A description is given of the special locality and method of extension of these secondary forms; and one section of the article deals with their differential diagnosis. The illustrations must be seen to be appreciated. Some forms of incipient opacities are quite characteristic. Thus the cataract of myopia consists of club-shaped masses with the small extremities converging toward the center of the lens; while the traumatic form resembles more a rosette of minute crystals, diverging from the nucleus. This lamp of Gullstrand's evidently enables one to see more of the structure of the lens than ever before.

The Nernst slit lamp has also been used by **Horlacher** in a similar investigation of 166 persons (233 eyes) between 41 and 83 years of age. He finds that the wreath of opacities in the deep cortex is the usual beginning of senile cataract followed by radiating striae. He gives fourteen illustrations of different arrangements of the opacity observed.

Spontaneous Resorption.—Spontaneous absorption of the Morgagnian cataract in a patient, 75, was described by **Gonzalez.** The patient had been under the author's observation for thirty years. Without history of injury the patient developed acute pain, accompanied by nausea, vomiting and vertigo. When seen by the author the following day, the anterior chamber was found to be completely filled with milky-white fluid, and intraocular tension decidedly elevated. The patient, declining operation, eserin, dionin and hot fomentations were ordered. The pain gradually ceased, the milky material in the anterior chamber absorbed, and the glaucoma symptoms disappeared, although the nucleus remained. The condition remained essentially unchanged for five years, until the patient's death. The author was able to find but one other case in the literature.

Treatment of Immature Cataract.—**Dor** and **Le Pendu** believe that the medicinal treatment of cataract is of value when started early. Dor uses a preparation of calcium chloride, gm. 4, iodide of sodium (desiccated), gm. 4 to 500 gm. of distilled water. The eyes are bathed with the solution every day for three months and at regular intervals subsequently throughout the patient's life.

Zimmermann reports the refractive history of a patient with developing cataract, who was first seen at the age of 52, at which time he was emmetropic and presbyopic. At 64 he developed incipient cataract and coincident myopia, and at 65 astigmatic error appeared in both eyes with the shallowing of the anterior chamber. There was gradual increase of both myopia and astigmatic error until at age of 75 the anterior chamber became less shallow and the myopia decreased along with the astigmatism. At the age of 81 with right correction —2.50 sph. and left, —2.00 cy. ax. 90°, patient was able to read Jaeger No. 1 at six inches, and No. 2 at nine inches, and No. 4 at 11 inches.

Green and **Green** describe their experience with treatment of senile cataract according to the methods of Col. Smith. The authors conclude that dense nuclear or subcapsular cataracts may be materially affected by treatment, which consists in the injection of 20 mm. of 1–4000 solution of cyanide of mercury under the conjunctiva, just below the external rectus and about 1 cm. from the limbus in a nonvascular area. One week after the injection the patient is given a 1 per cent solution of potassium iodide to be used as an eye bath on alternate nights, and on the alternate night the drop of a 2 per cent solution of dionin, strength of the dionin increased 2 per cent each month until 8 per cent is used. In seventy-two eyes so treated — 58 per cent reported as improved, 25 per cent as arrested and 16.5 per cent cataract progressed. The degree of improvement in vision ranged from 11 per cent to 150 per cent. The period of observation ranged from a few weeks to four and a half years. The authors show that vision a day or two after injection is lower than just prior, but improves rapidly thereafter until it reaches its maximum about one week after.

Cohen and **Levin**, in an illustrated article, report the results of radium treatment on cataracts, giving the results obtained in twenty-four cases. In the administration of radium, all the irritating soft rays were filtered off, and only the selectively acting gamma rays were utilized. The actual technic consisted in covering the radium with brass, photographic paper and gauze, and placing it over the closed eyelid. The distance between the radium substance and the eyelid was about 2 cm. The application usually lasted two hours. The authors conclude: (1), the application of radium to the eye is harmless; (2), there is diminution of lenticular opacifications under the influence of radium; (3), should a cataractous lens become matured subsequent to radium treatment, and should then an operation be required, no difficulties will present themselves; (4), it is therefore advisable to submit a sufficiently large number of immature cataracts with useful vision to a proper course of radium treatment, so that a correct estimate of the value of the method may be obtained.

Preliminary Operations.—It is **Terson's** belief that a preliminary iridectomy is advisable in diabetic cataract. He states, however, that it may be followed by an iritis, which may delay the performance of the extraction. Then, there is little danger of a relapse of the iritis. As to the danger of cataract operation in diabetics, the opinion of the authorities vary widely. Some say that the prognosis is bad, while others claim that it is little worse than in other forms, provided aseptic and dietary precautions are observed. The operation should be preceded by atropin, used for several days. The author advises a large conjunctival flap, made non-hemorrhagic by adrenalin, sutured by fine absorbable sutures.

Croskey favors operating on immature cataract as soon as the vision is reduced sufficiently to prevent the patient from carrying on his former pursuit, rather than waiting for maturity of the cataract. **Butler** favors preliminary iridectomy.

Discission of Lens.—The knife described by **Komoto** is, on the whole, the same as the Graefe narrow knife, but on the back it has a hook, so that after the cut of the membrane upon withdrawing the knife, the hole can be made considerably larger.

Mulock Houwer considers the large discission superior to several small incisions for the treatment of zonular cataract, and describes Straub's method of carrying out this procedure.

For the removal of traumatic and soft cataract in young people, **Santos Fernandez** is satisfied with discission, and reports a favorable case thus treated in a patient of 16 years, in whom the cataract presented without history of trauma.

Meller has written in criticism of the operations of Kruckmann and Mulock Hower.

Cataract Extraction.—In **Villard's** opinion the greatest danger in cataract operation is loss of vitreous, which in turn is due to compression of the eye by the action of the orbicularis palpebrarum. To prevent this latter, he has had recourse to temporary paralysis of this muscle, secured as follows: In the absence of novocain, about 5 cc. of 1–500 cocain hydrochlorat is used. The dangerous effects of cocain are avoided by giving the patient a cup of very strong coffee fifteen to twenty minutes before the operation. Under the usual aseptic precautions, several drops of cocain are instilled in the conjunctival sac a few moments before the injection, since the local action is slower than that of the injection.

With a glass syringe of 5 cc. capacity and a needle 3–4 cm. long, as small as possible and very sharp, the point is introduced above and to the outside of the end of the eyebrows. The puncture must be very deep, so that the fluid can infiltrate the deep as well as the superficial layers. The needle is directed gently downwards in the general direction of the malar region for its entire length, and about 2 cc. of fluid injected. It is then withdrawn and again introduced at the extreme end of the region just infiltrated. Its direction is changed, however, to inwards, towards the upper part of the ala nasae, following a course almost parallel to the inferior margin of the orbit, and about 1 cm. below it, and 2 cc. are injected.

The region of the path of the facial nerve is thus infiltrated, and the nerves paralyzed. If it is thought necessary, another injection can be made by inserting the needle 1–2 cm. from the external canthus and in the direction of the parotid gland, injecting this tract and two other tracts—one about 15 degrees above it and the other the same distance below. Care must be taken not to inject too close to the lids, as this would cause them to swell.

The duration of the paresis is about fifteen minutes. He has used this in many cases with great success. His conclusions are: 1. These injections cause a very marked temporary paresis of the orbicularis. 2. They are without danger if the solution is sufficiently weak and aseptic precautions are taken. 3. The paresis faciliates all operations where a large amount of the globe must be exposed, and prevents the involuntary and reflex contractions of the lid. 4. The injections are particularly indicated in cataract. 5. They are absolutely indispensable in cataract extraction in the capsule. 6. They are indicated wherever it is desired to prevent temporarily a blepharospasm, especially in facilitating iridectomy in acute glaucoma.

Herbert, discussing the free instillation of cocain and adrenalin preliminary to cataract extraction, finds that the stage of anesthesia may be nicely gauged by the degree of pupil dilatation. Time for complete anesthesia is thirty-five minutes. Cocain is instilled every 2–3 or 4 minutes. Drying is avoided by keeping the lids closed and by dropping sterile water on the cornea. This prolonged instillation frequently results in imperfect closure of the lids. This is readily obviated by placing the upper lid in position and retaining it by a pad. He concludes the possibility of ill effects of occasional over-use of cocain must be regarded as problematic. On the other hand, the advantages derived from the frequently attained complete anesthesia have been very convincing.

In discussing the effective use of eserin after simple extraction, he advocates five or six instillations of a 1 per cent solution, at one-minute intervals, immediately after operation. The effect is undoubtedly enhanced by the use of adrenalin. He concludes that, in so far as the attainment of security from iris prolapse is concerned, as yet the answer is not definitely negative.

With regard to the selection of an operation for cataract, **Santos Fernandez** concludes that for senile cataract extraction with a conjunctival flap and iridectomy is the safest means of overcoming the difficulties that arise in such an operation. However, the operation which has been habitually practiced is usually the best. For congenital cataract and that in adolescence extraction may be done after discission, if time is short.

The reasons given by **Olivares** for corneal suture in cataract extraction are: That it reduces the percentages of hernia of the iris and loss of vitreous; permits perfect coaptation of the wound, shortening the period of cicatrization and risk of infection; permits thorough cleansing of the parts and cuts down the period of lying in bed to a maximum of twenty-four hours. **Pacheco Luna** reports two cases in which he used the corneal suture. One patient was a diabetic and the other was suffering from pulmonary tuberculosis with large cavities. Both wounds closed well.

Rochon-Duvigneaud refers to Barraquer's method as a very excellent method of delivering the lens in the capsule. He does not believe that the method of Smith is a rational one, since, up to 45, the lenticular attachments are so strong that their rupture by his method is attended with danger to the eyeball. Similar objections might be urged against Barraquer's method, but when the age of the patient and the condition of the zonula are favorable to extraction in the capsule, or detachment of the lens as he claims all such procedures really are, the latter's method is the one to be preferred. **Portillo** writes on Barraquer's extraction of cataract, and **Moerno** has written on the vacuum extraction. **Benedict,** after rehearsing the advantages of intracapsular extraction of cataract, discusses the various proceedings, including that of Pagenstecher, Smith and Knapp.

Lister substitutes two assistants for one in the Smith cataract operation, one of them controlling the orbicularis with his thumb. For the right eye the left thumb of the assistant is used, his arm being extended at full length so as to remove his body out of the way of the operator. For the left eye the right thumb is used in a similar manner. The other assistant holds up the upper lid with the right hand and with the left hand pulls down the lower lid. The author finds that in this way the assistants learn their duties in a very short time, whereas it takes a long time to train a single assistant. He has used this method for two and a half years and prefers it to the one described by Smith. The assistants change their duties daily, keeping both in practice. **Guiral** and also **Hallett** have written on intracapsular extraction.

Bennett urges the immediate capsulotomy according to the technique of Trousseau. Two hours before operation the iris is thoroughly paralyzed by the instillation of 1 per cent atropin. Complete anesthesia is produced by the subconjunctival injection of cocain and adrenalin solution. In the incision nearly one-half of the cornea is taken and immediately the knife has passed the edge of the pupil, the point is depressed and the capsule entered and made to emerge just at the edge of the pupil. Then it is carried over to the other side of the cornea, the counter puncture is made, and the section is completed with a conjunctival flap. The speculum is then removed and the lens expressed by aid of the lids. No iridectomy is done. The author believes that the operation presents the following advantages: A round pupil; a minimum of instrumentation; a large opening in the anterior capsule, which obviates the necessity of secondary needling in the majority of cases; lessens the danger of vitreous loss; ease with which the operation is performed, and expression of the lens by means of the lids. It is not believed that the operation is indicated in hypermature cataract. Visual results in twenty-six operations are quoted.

Butler believes that the success of cataract operation is influenced by three classes of complications—those occurring during the operation, those that supervene during healing process, and those arising at any period, even years after successful operation. Few cases should be lost on the table, and, when lost, almost always it is the patient's fault. Complications of healing are held accountable for the majority of bad results. He compares statistics of English work and work in Palestine. In Palestine there were no cases of iridocyclitis, although 10 per cent in his English series. In Palestine series it is to be noted that the vision compares favorably with that obtained by the Smith operation in India.

Butler strongly urges the grouping of ophthalmic cases in special wards in order to produce an "ophthalmic atmosphere." As a routine the author has conjunctival cultures made in all cases to be operated upon for cataract. This interesting observation was made during the war: When it was impossible to keep the wards properly cleaned it was impossible to get sterile conjunctival cultures. After thorough cleaning of the ward the conjunctival reports were again negative. The author also lays stress on attention to the alveolar processes, as well as to lacrimal sacs. He prefers preliminary iridectomy. In doing an operation he first tries simple extraction, but if extra pressure is demanded, promptly does iridectomy. He desires a conjunctival flap, but makes no extra effort to obtain one. In 250 operations 87 per cent produced useful vision; 50 per cent, 6/12 or better. The author does not advocate discission in a patient who has 6/12 vision.

Wittmer, in an inaugural dissertation, reports on the cataract operations in the Heidelberg University clinic in 1915 and 1916.

Del Fresno describes his modification of von Graefe's operation for extraction of the lens in its capsule. He claims that loss of vitreous is less when movement of extraction is combined with pressure as he explains.

Weill reviews the history of the development of the form and use of the lance knife. He has used the following method in about 400 cases with very satisfactory results. Fixing the eyeball at the horizontal meridian he introduces the point of the lance in the corneoscleral region a little to the left of the vertical diameter and pushes it parallel to the iris very quickly toward the inferior angle of the anterior chamber. On drawing it out, always holding it parallel to the iris, he prolongs the incision in the limbus until it seems large enough, after which he follows the Graefe method. He claims for this operation the following advantages: (1) The incision requires no counter puncture and is very easy; (2) the shape of the lance and its method of insertion delays the escape of acqueous and prevents cutting of the iris; (3) the iris regains its position spontaneously, or by single massage of the cornea, and rarely prolapses into the wound; (4) the anterior chamber reestablishes itself more quickly than when a Graefe knife is used, lessening the danger of infection and making a conjunctival flap unnecessary; (5) postoperative astigmatism is less pronounced, as the wound is more regular and the lips adapt themselves much better.

Lefrancois practices discission of the posterior capsule at the time of extraction of the lens. The author claims that when a suture is used to anchor the conjunctival flap to the globe that there is no danger of loss of vitreous. After making the corneal section a silk suture is inserted through the conjunctival flap and through the episcleral tissue. After the lens is extracted and the anterior chamber washed the suture is tied. If the pupil is not clear the blade of a cystitome is inserted through the incision and the posterior capsule is cut vertically. The first fifteen cases operated by this method were simple extractions. Because of the danger of incarceration of the iris, the author has done iridectomies on the last eighteen cases with good results and no greater loss of vitreous. The visual results obtained in the cases in which this technic had been carried out were superior to that obtained by the old method.

Savage reviews the various types of cataract operations and discusses in detail those operations directed toward the removal of the lens in its capsule. **Takanouchi** writes on cataract extraction. **Fernandez** writes on the indications for operation in unilateral cataract.

Delayed Union.—Knapp notes that the formation of the anterior chamber is delayed if closure of the wound is not complete, and that the failure of closure of the wound is frequently evidence of glaucoma. He urges that intraocular tension should always be taken before operation. In one case the anterior chamber reformed only after several unsuccessful operations with three trephinings.

Infection.—Darier reported a case in which an infection followed the extraction of a black cataract. A preliminary iridectomy had been successfully done two months previous to the removal of the lens. The eye became red and painful and the patient complained of pain in the orbit and forehead. Rheumatic pains were also complained of. The author immediately administered one tablespoonful of polyvalant serum every day and injected sodium salicylate intravenously. An injection of 3 cc. of milk was given subcutaneously. Argyrol, dionin and atropin were instilled into the eye alternately every hour during the day. The temple was also scarified and hot compresses ordered. As the condition did not improve as rapidly as the author desired, he practiced the injection of essence of turpentine with the hope that a fixed abscess might raise the resistance sufficiently to conquer the infection. Ten days after the operation the inflammation had greatly subsided and a pupillary membrane was found. Seven months after the extraction an iridectomy was done. The eye healed promptly and 1/4 vision was obtained with a +5. Sph.

White and **Butler** report a case in which combined extraction was done with loss of vitreous. Eleven days later a line of pus appeared along the incision, and septic exudate from wound in the anterior chamber. Under general anesthesia, thorough cauterization, with actual cautery along the wound and evacuating the anterior chamber. The subconjunctival injection of 1-5000 oxycyanide of mercury was given, with a 10 cc. antistreptococcic serum into the abdomen. Culture showed pure pneumococci. The eye cleared up immediately. Vision 6/18 was obtained after needling.

After Cataract.—After cataract operations in the University Clinic of Heidelberg from 1913 to 1917 have been collected by **Berns.** Of 108 cases, twenty-eight cases recovered full vision, which is 25 per cent of the after-cataract operation; twenty-two times, or in 20.4 per cent of the cases, a visual acuity of 2/3 was attained; in sixteen cases, or in 15 per cent, vision was raised 1/2; in eleven cases, or 10 per cent, vision attained was 1/3. **Kuhnt** writes on the treatment of secondary cataract.

Lindgren reviews prevailing methods of dealing with secondary cataracts, and then describes his method used in cases of thick and dense secondary membranes following iritis. When six to 12 months have elapsed after extraction, he makes an incision with a broad cataract knife or with a keratome opposite to the coloboma. Using Axenfeld's synechiotome, he cuts the adhesions of the iris to the pupillary membrane, then grasps the membrane in the lower part with a sharp iris hook, or with Arlt's iris forceps, and rolls it up through the anterior chamber and out through the wound, where it is snipped off as close as possible. In two cases a drop of vitreous was lost, but in three cases none appeared.

Wootton presented a case of unusual appearance of a secondary cataract following extraction of a dislocated lens. Two years after the successful operation the patient received another injury which resulted in severe inflammatory reaction and producing hyphema and blood in the vitreous, associated with severe pain. A whitish membrane appeared in the pupillary space. The tension became normal and the eye quieted down, with a faulty visual field. The cornea presented a gelatinous appearance, most marked in lower quadrant. This area shows deep striated opacities permeated with pigment and calcareous plaques.

Peavler discusses the various methods of operating on secondary cataract.

Results of Traumatic Cataract.—The following statistics of vision were obtained by **Poulard** in fifty-five cases of traumatic cataract which followed war wounds. In thirty-eight the eye was wounded, and in the remainder it was only contused. In four the vision was almost nil; in thirteen, V=1/50 to 1/20; in thirteen, V= 1/10 to 1/2, and in twenty-four cases V=1/2 to 1.

The Vitreous Humor

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This review covers the literature from April, 1919, to April, 1920. For previous literature, see A. J. O., July, 1919, p. 132.

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DIGEST OF LITERATURE.

Hyaloid Remains.—Using a Nernst lamp, **Vogt** was able to study hyaloid remains which apparently lie on the outer surface of the posterior capsule of the lens. They are seen as white radiating lines which are from 0.02 to 0.6 mm. broad. The genesis is obscure, but they are apparently embryonal remains. A similar condition is also found in rabbits and dogs, where it is more temporal than in the human eye.

Reflexes From Hyaloid Membrane.—The so-called water wave reflexes of the fundus are discussed by **Curran.** The author contends that they are due to reflection of light by the hyaloid membrane, and not by the retina. To prove his contention he argues that the reflection of light could not take place from the retina because of its histologic nature, but the fine glassy structure of the hyaloid membrane affords an ideal reflecting surface. In certain diseases the membrane becomes folded and produces varying characteristic reflexes, which the author believes are of clinical significance.

Hyaloid Membrane in Aphakia.—**Ziegler** called attention to the adventitious hyaloid membrane, which is liable to form in aphakia; where the incision of the iris and capsule exposes the vitreous to the action of the aqueous. The two characteristic symptoms are: (1) A faint opalescent reflex from the vitreous surface when examined by oblique illumination; and (2) inability to correct the near vision beyond J. 10 or 12, although good distant vision can be obtained with correction.

After making a V-shaped incision into the vitreous surface, in the pupillary area, the author has been able to obtain good reading vision. (J. 1 to 4.)

Ziegler believes that the film seen by oblique illumination is really a tangible membrane, because there is a distinct sensation of resistance at the line of division, and an iridic reaction with widening of the pupil occurs after it is cut.

Vitreous of the Ox.—**Hijikata** concludes (1) that in the newly dead eye of the ox lactic acid is a constant constituent of the vitreous; (2) in autolysis of the vitreous of the ox-eye there is a distinct formation of lactic acid, and the existing lactic acid is later destroyed during a long period of digestion.

Mycosis.—In the microscopic study of stained sections of an eye which had been removed for pain and inflammation, following a penetrating wound of the sclera, **Morax** found mycelium filaments in the vitreous. The mycotic areas were surrounded by an inflammatory exudate in which the mononuclear leucocytes predominated. Infection of the vitreous by fungi is rare.

Hemorrhage.—The anatomic changes which were observed in a large number of cases of vitreous hemorrhages, of spontaneous or traumatic origin, are recorded by **Fuchs.** The author refers to hemorrhages on the outer surface of the vitreous, and discusses the special features noted when they are located in the postlenticular and orbital spaces and between the vitreous and retina.

In dealing with hemorrhages into the vitreous itself, he divides them into: (a) Rare cases confined to the outer limiting layer, the blood corpuscles being arranged in rows in conformity with the lamellated structure of this layer; or (b) spread immediately under it. In this case the origin is usually the ciliary region, the corpuscles are often arranged in layers, and if the hemorrhage is large, it may spread out in the form of a cup; (c) penetration of the hemorrhage into the vitreous, in which case it spreads out irregularly or fills up pre-existing spaces, such as the hyaloid canal, or spaces resulting from liquefaction of the vitreous, or the entrance of a foreign body. If no spaces exist the blood may be more or less sharply defined from the vitreous, or the erythrocytes form irregular strands in the adjacent tissue.

From the arrangement of the corpuscles in hemorrhages, Fuchs concludes that the vitreous is composed of a framework of membranes which spread out in a fan-like arrangement from the vitreous base at the ora serrata. The fibers which run inward are curved with the convexity directed forwards; those which run backward are curved convexly backwards, while the lamellae between have a more or less straight course inwards. The red blood corpuscles may be normal or exhibit changes in form, as the result of shrinkage, swelling or hemolysis. The absorption is effected by hemolysis and phagocytosis.

The presence of blood or its derivatives does not excite a reaction of the vitreous. When white blood corpuscles or new-formed fibrous tissue are found there has been a chemotaxic irritation of the ciliary region.

Woodruff presented a young man 20 years of age who had had recurrent hemorrhages into the vitreous. The Wassermann test, the urine and test for tuberculosis were all negative. The author was unable to determine the etiology of the condition.

Schneider reported a case of hemorrhage into the vitreous following a direct trauma to the eye.

The Retina

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This section of the Digest carries the literature from April, 1919, to May, 1920. For previous references see A. J. O., July, 1919 pp. 134 and 145.

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DIGEST OF LITERATURE.

Anatomy.—Based on the histologic examination of eyes with healthy retina, **Krueckman** gives now the modification of his views formerly held about the perivascular lymph spaces of the retina (Y. B. 1917, v. 13, p. 102). A membrana limitans gliae perivascularis can be found in the optic nerve and in the retina. The perivascularis is closely adherent to a fine mesodermal membrane. The space between the endothelial tube forming the capillary and this mesodermal membrane is the pericapillary lymph space; it exists at all capillaries. He did not succeed in finding it around the arteries and veins, though it must be there also. With his stereomicroscopic method of examining the fundus, **Koeppe** could demonstrate the yellow color of the macula, at least in the most anterior portions of the retina immediately surrounding the central fovea. He could confirm this again in embolism of the retinal artery. (See under Pathology.)

Tortuosity of Vessels With Pseudo-Neuritis. — Mazzei observed marked congenital tortuosity of the retinal vessels in a man aged 19 with low vision; his two brothers also had poor sight. The case is classed as one of congenital tortuosity of the vessels with pseudo-neuritis.

Anomalous Relation Between Macula and Disc.—In two cases of **ten Doesschate** the relative location of macula and disc differed widely from the normal. Similar anomalies recently published are discussed and explained by him. For Congenital Cone Blindness, see **Eason,** under Nyctalopia.

Cilio Retinal Arteries. — Zentmayer showed a woman whose right retina was entirely supplied by the ciliary circulation. A large cilio-retinal artery emerged at the upper disc margin, giving off branches to the temporal and nasal fundus. Another one at the lower margin supplied the lower temporal region; a third at the lower nasal margin was going to the lower nasal fundus; finally a small one was found at the lower nasal margin. All vessels showed the typical crook bending back on the surface of the disc.

Coloboma of the Macula.—The congenital coloboma of the macula in both eyes of **Agatston's** patient, a girl, aged 11, appeared as a well-defined circular area of the macula in which the choroidal vessels and pigment changes were lying in front of the white sclera. Wassermann was negative. See also **Strebel,** under Hemorrhage.

Cyst of the Retina.—A congenital multilocular cyst was found by **de Schweinitz** and **Wiener** in a man, aged 22, whose left eye was poor since childhood. In the macula was a white atrophic spot, slightly larger than the disc. From the upper half of this area protruded for 4.5 D. a large cyst formation like an observation balloon. It was covered by small vessels and appeared transparent. From the lower temporal edge of the cyst a 3 d. d. long, narrow, transparent tube extended, carrying two atrophic vessels and resembling a manifest canal of Cloquet. The canal ended in a cyst mass about four times as large as the one in the macula; the mass appeared like a rounded cone with the base in the temporal periphery. On its surface were numerous small cysts or vesicles. Below, the retina was elevated 2 D. No positive conclusion as to the nature of the condition was reached, but it is assumed that in the intrauterine life some type of retino-choroiditis developed and that cystic changes occurred in the secondary exudative processes.

Anomalous Fundus.—In the right eye of a man, aged 20, with vision 0.03, **Finnoff** found a veil-like membrane, covering the upper third of the disc and extending upward. The membrane was funnel-shaped and projected greatly into the vitreous; the base of the funnel flattened, was in front of the equator and was bordered by pigment. A greenish, glistening fold, beginning on the disc, was seen on the surface of the funnel projecting into the vitreous. The upper nasal fundus showed no vessels. The condition is considered as congenital. Retinitis proliferans would not be accompanied by absence of retinal vessels in the upper nasal quadrant.

Physiology.—Using a specially constructed spectroscope, **Goethlin** found that a normal dark adapted observer would perceive as red, in a field of 3 degrees, light of 834 microns and in a field of 45 minutes light of 822 microns. For the eye adapted for 50 lux the liminal value for the sensation red with a field of 45 minutes was four to five times as high; and with the macular field of 3 degrees from nine to fifty times as high as for the dark adapted eye. The liminal value for red, at least in the macula, is raised as soon as in the stimulated retina, cones and rods are stimulated at the same time. Adaptation for light from the sky during 3 minutes raised the liminal value for red 150 to 500 times in the peripheral portions of the macula, depending on the wave length. In the normal dark adapted eye the liminal curves for rods and cones cross near 660 microns. In the spectral zone, 620 microns to 820 microns, the author found in foveal vision, neither during total dark adaptation nor during adaptation for 50 lux, a photochromatic interval. In a protanomal dark adapted eye the following deviation from the normal were found: 1. The liminal value for red of 680 to 760 microns is about twenty-eight times as high as in the normal. 2. In that eye a large photochromatic interval was found in foveal as well as macular vision, from the short wave to the long wave perception, limits for red. In the region 640 to 760 microns the liminal value for color is sixteen times as high as the liminal value for light. 3. A colorless region exists at the long waved end of the visible spectrum for the protanormal eye.

In the freshly enucleated eyes of dogs, **Sheard** and **McPeek** observed the effect on the electric condition of the retina produced by exposing it to lights of different colors. The results obtained seemed in conformity with the Hering color theory, indicating that complementary colors produced opposed effects. **Riedel** has studied the photo-electric reaction of the retina in the human eye.

The chromatic thresholds for red, green, blue and yellow in different parts of the retina have been investigated by **Ferree** and **Rand.** They were taken along different meridians at intervals of 1 to 5 degrees, according to the rapidity of change. The wave lengths of the different colors used—red, 670 microns; yellow, 581 microns; green, 522 microns, and blue 468 microns. The intensity of stimulous required to produce the color sensation was measured in terms of energy with the thermopile, all being reduced to the energy value of blue.

They found the decrease in sensitivity of colors from the center toward the periphery of the retina is very irregular, and more so in the temporal than in the nasal meridian. Thus, for red in the temporal meridian there is very little decrease until 20 degrees is reached. Then the curve rises sharply to 44, where it becomes almost vertical. They also found there was no uniformity of ratio between the different colors. The other colors made sufficiently intense could be recognized nearly to the limits of the field for white. But this is not true for green, the field for which lies far within that for the other colors, no matter how intense the stimulus. These authors discuss the bearing of such facts on color theory especially that of Hering. The absence of any corresponding in the fields of paired colors, red and green, or yellow and blue, and the absence of their perception in cancelling proportions in the color blind parts of the field contrary to the observations of Hess and others constitutes a very serious obstacle to the acceptance of such a theory.

Rochon Duvigneaud confirms the findings of Max Schultze that the retina of diurnal animals contains more cones, that of nocturnal ones mostly rods. The chameleon's retina contains cones exclusively, and the nocturnal lizard has only rods. Other parts of the eye, such as cornea and pupil, vary with the nocturnal or diurnal habits of the animal.

Placing the posterior half of the frog's eye after removal of the vitreous into the micro-spirometer of Thunberg-Winterstein, **Doyer** examined the oxygen consumption of the specimen. The retina needs more oxygen than the spinal cord; sclera and choroid use very little. An interrelation between choroid and retina was noticed only when a dark adapted eye was illuminated suddenly.

The binocular sensation of brightness is investigated by **Roelofs** and **Zeemann** again (Y. B. 1914, p. 257). Their results are practically the same as those of Hering. A grey offered to the two eyes in unequal intensity produces no rivalry of the fields, but a blending of the impressions. This is not a summation of the stimuli but the sensation of brightness is rather the average of the two impressions. Strong contours of the object for the one eye will help that impression to prevail.

Measurements on the value yellow of red lights with the newly devised color mixing apparatus of Asher, undertaken by **Goldytsch** were made by the admixture of blue light to the contrast producing colors, until all blue character was lost and pure green was seen. The value yellow decreased from the orange to the infra-red, but showed variations according to individuals while being constant for each individual.

In studying colored after-images **Dietz** finds a distinction must be made in the field of vision between the color field and the contrast field. The color, extension and intensity of illumination of the contrast field have an influence in the production of the after-image. If the extension be limited by a tube blackened inside through which the colored field only can be seen, the complementary colored after-image tarries. If the contrast action of the blackened wall of the tube is made as small as possible by letting the light reflected from the colored field shine into the tube, so that the tube wall is seen in the same color, the color field will act as a light field and the after-image will only be a black spot, as if the field fixated had not been colored but white. As soon as a contrast field appears in the visual field besides the colored field the complementary after-image will appear. From this must be concluded that it is not the colored field as such which produces the complementary after-image, but that the contrasts present in the visual field are responsible for it.

According to the new theory of vision proposed by **Sir Oliver Lodge**, certain atoms in the retina, possibly in the pigment epithelium, would be stimulated into radio-activity by the impact of light. These atoms would accumulate energy of the right frequency and stimulate the nerve, the eye being sensitive to light vibrations and to no other. Some retinal pigment should be exposed to red, green and violet light in the electroscope to see whether electrons stimulating the electroscope would be given out by it.

The comparison of luminosity of colored lights contains so many difficulties that its possibility has been doubted on theoretical grounds by v. Kries.

This problem is now investigated by **Bender** with the Lummer-Pringsheim flicker photometer. Visual acuity and flicker values of the same eye were compared, and the curves thus arrived at tally quite well, but the flicker method is more exact. The maximum of luminosity was found between 580 and 590 microns. The sensitiveness of luminosity is the subjective sensation of brightness in the relation to the normal spectrum and to constant energy.

The foveal sensitiveness was investigated in ten individuals with normal color sense; it differed in different individuals; the average of its maximum was about 550 microns and was constant for each individual. The curves of two totally color-blind individuals coincided well; compared with the normal they showed a steeper ascent and descent and a narrow base; the shortening was greater at the red end than at the violet. These are the first curves of sensitiveness of totally color-blind eyes. The curve of sensitiveness of normal eyes equals more and more that of color-blind eyes, the further to the nasal side the examined portion of the retina is. These examinations were made by examining the retinal periphery of a dark-adapted eye with a small field of great luminosity. From these examinations follows that under these conditions the dark-adapted rods are already superior to the cones at 20 degrees from the fovea.

Investigating the perception of light intervals, **Gildemeister** found that the duration of a light flash, to be just perceptible, must be longer the weaker the light. With very long light flashes the light quantity increases with increasing duration. With stronger light, shorter intervals are needed than with weaker light to make the interval just perceptible. The smaller the field the longer is the minimal interval. Rythmic interruptions have the same liminal values as single ones. A small field limited to the fovea, after a dark adaptation of from 5 to 10 minutes, was examined. The ability of the eye to recognize obscurations of small fixed fields depends very little on the dark adaptation; the opposite is found when large fields are observed. The subjective sensation of momentary obscurations of the field is felt as "rather an increased luminosity than an obscuration."

Investigating the behavior of the retina in the frog and two fishes (Ameirus and Abramis), **Arey** found that the threshhold of stimulation of the rods and cones and of the pigment, at which they exhibit their characteristic photomechanical changes, is high. The alleged great sensitivity of these elements to light of extremely low intensity is consequently disproved. Although responses may be initiated at lower intensities, in general an approach to a maximal light response is first elicited at an intensity which makes ordinary print legible. Since the responses in weak light are substantially identical with those in darkness, the mechanical conditions are present for a theoretically more efficient dim-light and bright-light vision.

Visibility of dark lines against a bright background has been investigated repeatedly. **Bell** therefore undertook to study the visibility of bright lines, a thread or a fine wire, against a dark background. It is noteworthy to find a close agreement between dark on bright and bright on dark. The minimum visible for a linear object with strongly contrasted background is less than 1/50 the minimum for a round spot giving similar contrast, a remarkable evidence of the efficient coordination of retinal impressions. See also Adaptation and Adaptometers.

Subjective Phenomena.—Three patients of **Ferro,** men of about 50, complained that occasionally the sight of one eye would be gradually shut off, and then return again in the same way, comparing the sensation to the lowering of the asbestos curtain in the theater. Two of the patients were healthy and had normal fundi. The author can give no explanation. **Sauvage** has written on visual illusions. The persistence of after-images on different parts of the retina are the subject of a paper by **Woog.**

Diagnosis.—Ophthalmoscopic changes such as edema of the disc accompanying acute inflammations in the anterior part of the eye have been known for some time, **Vogt** reminds us, but with red free light, he has seen typical retinal changes, similar to those seen in acute retinitis and in contusion of the eyeball. They consist of radial double contoured reflex lines beginning in the macula, the two contours of each reflex converging at each end. They lie in front of the nerve fibers and vessels and seem to be formed by folds of a fine membrane between retina and vitreous. These conditions have been found in herpes of the cornea, phlyctenular conjunctivitis, episcleritis, etc. At times the lines are in one sector only. In some cases the neighborhood of the disc is also affected, showing double contoured white lines parallel with the disc margin, mostly on the temporal side. The foveal reflex is lost. With the improvement of the underlying condition the lines gradually break up and disappear. These changes are only found up to the age of 45, and in cases in which iris irritation accompanies the disease.

Pathology.—Roenne reports on the histology of the eye in amaurotic family idiocy of the Spielmeyer-Stock variety. (Y. B., 1909, p. 244.) The patient, who died at the age of 14, was normal until the fifth year; then loss of vision and arrest of mental development with epileptic attacks set in. The ophthalmoscope showed typical retinitis pigmentosa and yellow atrophy of the discs with thin vessels. Examination of the central nervous system will be published separately, but shows the ganglion cell degeneration described by Spielmeyer. In the eyes rods and cones were entirely destroyed, the pigment epithelium was intact, but many of the cells had lost the pigment content.

In the outer nuclear layer the arrangement of the nuclei was entirely gone, their number was diminished and the size irregular; this layer contained round cells containing pigment. The outer reticular layer was gone. Inner nuclear and inner reticular layers were almost normal but contained pigment. Large, branched plugs of pigment cells were present in the inner nuclear and reticular layers, and partly also in the outer nuclear layer. Ganglion and nerve cells were almost normal. The whole forms the typical picture of Spielmeyer and Stock, consisting of depigmentation of the pigment layer and grave disturbance of the neuro-epithelial and outer nuclear layers. Pigment masses in the outer and inner nuclear layers are the result of greatly altered capillaries; the condition is materially different from pigment degeneration.

For the study of the anatomy of detachment **Hanssen** examined both eyes with spontaneous detachment of the retina of a patient who had been very myopic. The left eye had been repeatedly operated on and also had a cataract extraction done on it. The retinitis of Leber, the cellular membranes on the inner side of the retina were absent; also no hyperplasia of the pars ciliaris. The glious membranes and fibrillary formations in the periphery of the vitreous have undoubtedly exerted a shrinking pull on the retina, but a good many of these conditions are secondary. Adopting Wolfrum's views of the origin of the vitreous, one can easily assume that under pathologic conditions a fibrillary degeneration of the vitreous can actually take place. The uvea shows infiltration, connective tissue proliferation and degeneration, pigment epithelium changes and "Druse" formation. In the retina degenerative changes are found. The uveal changes are a continuation of the process whose beginning is not observed, but which has a rôle in the origin of the detachment and they are not secondarily produced by the subretinal fluid. Early operation is indicated before secondary adhesions have formed.

The treatment of detachment of the retina gives such poor results because the underlying anatomic conditions are so little understood, **Gonin** declares microscopic specimens give a better idea of the causes for detachment. He distinguishes the following mechanisms: (a) Sublatio retinae, lifting up of the retina. Here the retina alone, or retina and choroid together, are pushed up out of the normal position by serous or hemorrhagic accumulations from inflammations, arteriosclerosis, operations, trauma, etc., by tumors of the retina and choroid and the exudates accompanying them. The retina shows very few folds and the subretinal fluid is entirely different from the vitreous. Of ninety specimens of his collection belonging in this group, the detachment was probably due to a primary serous exudate of the choroid only in ten eyes.

(b) Attractio retinae, pulling up of the retina by the shrinking vitreous following inflammations when it is adherent to the retina, or by cicatrical contractions of adhesions after wounds of the anterior half of the globe near the ciliary body. Perforations behind the ora serrata lead only to adhesions of retina and choroid, but not to detachment. Contraction of the vitreous adherent to the anterior surface of the retina will lead to idiopathic detachment and to tears in the retina, as described by Leber. Through these tears the vitreous gets into the subretinal space. Of 125 specimens belonging in this group ten were idiopathic detachments.

(c) Distensio retinae, stretching of the retina. This factor has been held responsible for detachments in myopia, but the retina can stand a good deal of stretching without detachment as in staphyloma or in buphthalmia. Only sudden distension by traumatism will lead to detachment, and in these cases the retina is torn off at the ora serrata or, rarely, at the optic nerve. His collection contains twelve eyes with undoubted rupture by distension.

(d) Depressio retinae. This is the opposite of the stretching and will occur when the eyeball diminishes in size after sudden loss of vitreous or after slow atrophy of the globe.

In his studies of the regeneration of the coats of the eye after experimental wounding, **Urra** finds that the process in the retina (see also Y. B., 1918, v. 14, p. 144) depends apparently on the degree of the traumatism, but the retina generally atrophies because of its delicate structure. After a simple cut the retinal structure can still be recognized, but the retinal elements atrophy after forty-eight hours following more extensive traumatism, and are replaced by a scar. Greater destruction produces detachment; in the edges of the detached retina the ganglion cells regenerate. The retinal elements finally atrophy and are replaced by connective tissue containing chorio-retinal pigment. Because of its vascularity the choroid furnishes all the material for repair in the extensive destruction.

Tumor-like thickening of the macula is reported by **Elschnig**, the case being the second one of its kind examined histologically. A man, aged 66 years, with densely placed yellowish round drusen in each macula, developed three months later a gradually increasing prominent white focus in the right macula. In the center of the focus newly formed vessels appeared, and the edges were pigmented; no detachment of the retina was noticed. Though doubting the malignancy of the condition, Elschnig enucleated the eye upon the request of the patient. Histologic examination proved the growth to consist of fibrous richly vascularized connective tissue, with hyaline degeneration. Gila and pigment epithelium proliferation shared in the tumor formation. The progress seemed to have begun in the retina, probably in the connective tissue of the vessel walls and to a minor degree in the glia. The whole is looked upon as a chronic degenerative process caused by primary arteriosclerosis of the ciliary and choroidal vessels; no relation to exudative retinitis exists. The anatomic peculiarities of the fovea are to be considered the cause of the intense tissue proliferation.

The histology of exudative retinitis was studied by **Berg**. The eyes examined were: The right one of a boy of 13 with detachment and tumor-like protuberances of the retina and increased tension; the right eye of a 2-year-old boy with yellowish-red masses suspected to be glioma; the right eye of a boy of 15 years showing white masses and hemorrhages in the retina with glaucoma, following scarlatina nephritis. The primary conditions are changes in the blood vessels of the retina. These produce larger and smaller hemorrhages in and behind the retina, serous and sero-fibrinous exudations and more or less extensive necrosis of the retina. As a reaction, proliferation of glia and pigment epithelium follows with formation of new connective tissue on the inner side of the choroid and along the retinal vessels. This brings about adhesion between retina and choroid. The miliary aneurisms have a similar origin as those of the brain. The etiology of the disease is still to be determined; an embolic cause of the vascular changes after infectious diseases is possible. The great resemblance of the affection to von Hippel's disease is pointed out, as well as the possibility of their being different degrees of the same process. See also **Holm** under Exudative Retinitis.

During ophthalmoscopic examination of thirteen cases of typhus exanthematicus, **Gutmann** found the blood column in the arteries narrow, the veins were dilated; no hemorrhages. Histologic examination showed a typical vascular affection, the beginning of which is a circumscribed thickening of the arterial wall beginning from the endothelium of the intima; later cell infiltration in the media, adventitia and surrounding connective tissue, followed.

In microscopic specimens of a case of bilateral perivenous hemorrhages of the retina near the disc of typhus exanthematicus, **Nauwerck** found no infiltration in the retina. The arteries were normal, the veins wide, containing a granular, thready thrombus. The choroid showed marked cellular infiltration in the chorio-capillaris, in the outer layers, or even in the whole thickness; the cells were plasma, lymphoid and mast cells with few polys.

Mawas demonstrated the histologic changes of the chorio-retina in contusion of the globe from war injuries.

Only in exceptional cases are retinal cysts seen on ophthalmoscopic examination; they are only found on histologic examination and are comparatively rare, **Gallemaerts** declares. The true retinal cysts, those originating in retinal tissue, are always connected with detachment, as in the two cases he reports, and they appear only in a retina with gliomatosis. As to the mode of development of the cysts he favors the theory that the cysts are formed first and are filled with liquid afterwards. They develop in all layers and begin with the formation of a pale staining area around the retinal nuclei; the area gets larger, the nuclei disappear and the cavity thus formed fuses with adjoining ones. Cysts also form on the basis of tubular neuro-epithelial invaginations. The tubes are transformed into closed cavities, the cells lining them degenerate and disappear.

Guyton gives the report of a case of proliferating endophlebitis and retinal hemorrhages in the right eye of a man aged 71 with marked nephritis and high blood pressure, whose eye became blind within three days. The fundus showed the classical picture of thrombosis of the vein. Seven days later glaucoma set in, necessitating enucleation. Sections showed diffuse hemorrhages in the retina, decided angiosclerosis and obliterating proliferative endarteritis and endophlebitis.

In the right eye of a boy, aged 12, suffering from broncho-pneumonia of grippe, **Wessely** found embolism of the central artery; twenty-four hours later death occurred. The histologic examination showed the central retinal artery, not far from the lamina cribrosa, totally occluded by a thrombus of rather large extent.

Studying the pathologic histology of the living retina with the Gullstrand Nernst slit lamp in embolism of the central retinal artery, **Koeppe** could verify the findings of Vogt as to the yellow color of the macula, at least in the perifoveal portions. In the later stages of the embolism, disturbance in the deeper layers by formation of cysts in the region of the fovea takes place, as has already been proven anatomically by Elschnig. The white opacity of the retina is almost entirely due to affection of the interfascicular lymph spaces. From this must be concluded that an actual edema exists along with the cellular and degenerative changes in this region, proving on the living the anatomical findings of Leber, Rubert, Siegrist. The radial folds described by Vogt are real folds of the limitans interna. See also **Gamper**, under Angiomatosis.

Photophobia.—Reviewing the theories of Nagel, Roemer, Feilchenfeld, etc., as to the pain of photophobia, **Peters** gives the following explanation based on the work of his pupil Hartmann. Under normal conditions no real pain is produced by glare. But in individuals with manifest or latent affections of the trifacial nerve, asthenopia, lacrimation and photophobia are symptoms of hyper-sensitiveness of the trifacial nerve and are found even without refractive or muscular errors. Pressure on the supraorbital branch is often painful, and these symptoms disappear by treatment with ergot, quinin and iron or with tincture of eucalyptus. Lacrimation in the cold is a typical symptom. The relief obtained from the use of atropin is due to the effect on the nerve fibers in the iris. The retina has no nerve fibers able to convey pain, as assumed by Bjerrum and Feilchenfeld. The photophobia and blepharospasm in phlyctenular affections are due to the roughness of the cornea and to real pain from irradiation in the hyper-sensitive trifacial.

Extreme photophobia has interested **Santos Fernandez** for years. His first patient had his cornea burned by cigar ashes, and treatment with lead water was followed by incrustation of the cornea that had to be removed to relieve the photophobia. Photophobia will make patients seek the darkness, and this will result in damage to the general health. Bandage in these cases is therefore indicated. Photophobia is found under different conditions such as foreign bodies, corneal abrasions and ulcers, iritis, phlyctenular disease, etc. Superficial abrasion of the cornea by a comb in one of his patients gave rise to the most violent suffering, while another patient whose cornea had been cut through was quite free of pain. After the eclipse of the sun in 1878 he saw cases of hyperaesthesia of the retina. In hysteria and incipient cataract patients will suffer from the glare. The central scotoma of alcohol or tobacco poisoning will make the afflicted shun the light. The blind can have no photophobia. Some patients see only with the rods, and seek therefore the dark.

The pain in the photophobia of inflammations of the anterior part of the eye is due to continuation of the process to the retina. (See Y. B. 1916 v., p. 214.) He reports the following cases: 1. Patient, aged 27, who had been suffering from interstitial keratitis presented extreme photophobia, which prevented inspection of the eye until thorough local anesthesia made removal of a piece of carbon from under the upper lid possible. 2. A lady of 75 similarly suffered from photophobia produced by a piece of coal on the conjunctival tarsi. 3. Cataract extraction on a woman, aged 45, had to be abandoned because of the great sensitiveness, but was finished without difficulty, after thorough cocainization, on the next day. Extreme photophobia during the next sixty days made inspection of the eye impossible, and was apparently due to a slight iritis, judging from the final good vision. 4. Interstitial keratitis in a child of 4 years produced photophobia which lasted, in spite of treatment, one year, and was so intense as to prevent inspection of the eye. The treatment is to take the etiology into consideration; bandage, cocain, dionin, etc., are of value.

Reviewing the causes of photophobia and speaking of the different kinds of colored glasses, **Ribon** says affections of the eye may be produced by improper colored glasses. He dwells on the danger of observing the sun through glasses that are not sufficiently dark, and mentions the blindness of Galileo, Cassini and Plateau acquired in this manner. Blue glasses fatigue the retina. Patients with optic atrophy like yellow glasses, because they give the sensation of greater brightness. Smoked glasses of different shades are best because they reduce all qualities of the light. It is advisable to close the eyes for a while, or to shade them, after removing colored glasses, in order to get the eyes accustomed to the new conditions.

Dazzling. — Of thirty-eight aviators examined by **ten Doesschate**, none complained about the eyes or vision, but he found ring scotoma in seventeen, which in two cases was connected with the blind spot by radial relative scotomas.

Investigations on the subjective dazzling by light by **Lohmann** gave the following interesting results: Dazzling is greater the greater the disproportion between the general illumination and the dazzling light. Increased incident angle has greater dazzling effect. Dazzling of one eye, when concerning the macula, influences the other eye such that in the rivalry of visual fields the test object appears to the non-dazzled eye only occasionally. Marked difference between the temporal and nasal halves of the retina were found. A colored glass increases the dazzling effect because the resulting increase in adaptation is so much greater than the diminished dazzling produced by diminished luminosity of the light. The influence of corneal scars is shown, and it is possible to give a numerical estimate for the degree of dazzling produced by the corneal opacity. Fundus affections predispose to dazzling because of the disturbed adaptation. Unilateral cataract may diminish vision, and vision will improve when the so affected eye is closed.

Loss of Retinal Pigment.—Normal fundi but marked absence of retinal pigment, allowing all choroidal details to be seen clearly, were found by **Smith** and **Shastid** in a girl of 8 years with compound hyperopic astigmatism who only began complaining of her eyes hurting and watering two months after scarlet fever. It is assumed that the retinal pigment was probably absorbed as a result of the toxemia, and the improvement in vision is attributed to the use of the spectacles which not only corrected the ametropia but also stimulated the formation of visual purple. This condition the authors have noted several times after scarlet fever, and suggest the term "aphykia" for it—from phykos, pigment.

Fundus Changes After Measles.—**Cridland's** patient had good sight while at school, and it failed only after measles. Evidences of former iritis were found in both eyes. The vessels near the discs were tortuous and the lower parts of the discs were covered by dense, white organized exudate. An extensive uveitis, probably with some neuritis, is assumed to have occurred during the measles.

Pernicious Anemia.—Both eyes of **Cridland's** patient, a soldier who had been discharged because of pernicious anemia, showed discs pale; the vessels were pale and appeared almost empty. Hemorrhages, varying from disc size to pin's head, and lying in the nerve fiber layer or deeper, were scattered over each fundus, but more numerous around the discs. The hemorrhages showed tendency to clear up.

Quiescent Foreign Body in the Retina.—**Knapp** reports the case of a quiescent foreign body in the retina in a man into whose eye something flew four months before, while he was cutting stone. In the macula a distinct foreign body could be seen; the magnet could not dislodge it, and no siderosis existed. In the discussion Lambert mentioned a similar case where the foreign body was surrounded by an atrophic area.

Miliary Aneurysms.—**Zeeman** demonstrated a case of retinal degeneration with multiple miliary aneurysms (Leber).

Retinal Circulation. — Before the Paris Ophthalmological Society, **Bailliart** reported in detail the results of his researches on the retinal circulation, under normal and pathologic conditions, as found according to the method developed by him and already described in several papers (Y. B., 1917 v., p. 103; Y. B., 1918 v., p. 141). The pressure in the retinal artery is estimated from the amount of pressure with his dynamometer, which applied on the temporal side of the sclera will produce and abolish pulsation of the artery, if the intra-ocular tension of the examined eye is known, both before pressure is applied and while the maximum pressure used is exerted. To avoid this second tonometric reading, **Magitot** and **Bailliart**, based on experiments on the cat, compiled a table which gives the figures of increase of the different intra-ocular tensions by different dynamometric pressures. Systolic pressure in the retinal artery of the normal eye is about 70 mm. and the diastolic 25 to 35 mm. These figures differ somewhat from his former ones, because he then based his calculations on an intraocular tension of 18, and now one of 20 is assumed.

A local rise in the retinal arterial blood pressure is found with increased general blood pressure, in dilation of the main arterial trunk, or with constriction of the branches. It is met in albuminuria, diabetes, syphilis, optic neuritis, thrombosis of the central vein; it is complicated by hemorrhage and sclerosis of the vessels. Low retinal arterial pressure is found in general low blood pressure, spasm of central artery or contusion of the globe. In venous retinal pressure, as in arterial pressure, the relation between vascular pressure and intra-ocular tension is of greater importance than the absolute figures. The venous pressure near the exit from the eye is very near the intra-ocular tension and therefore between 18 and 22. Spontaneous venous pulsation is found in increased and also in diminished venous retinal pressure.

Increased venous retinal pressure is found in venous thrombosis; it does not always accompany increased arterial pressure; it is caused by an obstacle to the venous flow or by arterial and capillary dilatation. Lowered retinal venous pressure cannot be measured. When the intra-ocular tension rises above the capillary pressure, circulatory disturbances, at first in the periphery, of the retina will result, producing contraction of the field. When the intra-ocular tension rises the arterial pressure also tends to rise. When the arterial pressure sinks, while the intra-ocular tension remains normal, a similar disturbance of the equilibrium as in glaucoma occurs. Glaucomatous excavation without increased tension may thus be explained. In most cases the intra-ocular tension remains normal in spite of increased arterial pressure, but hemorrhagic glaucoma may develop in albuminuric retinitis.

The study of circulatory disturbances gives indications for treatment. In arterial hyperpressure vasodilating drugs, as nitrites, are wrong, because they will lead to raised pressure in the capillaries and veins, with consequent greater danger of hemorrhages; only hygienic regimes might be employed. In beginning excavation of the disc with normal intraocular tension, on the other hand, the peripheral vessels are small, and strychnin would make conditions worse by producing vascular spasm. Vaso-dilating measures are indicated. Pilocarpin has seemed of benefit in retinal affections of high vascular pressure. For a better understanding of the retinal circulation it will be necessary to study that of the choroid. In the discussion that followed Duverger and Barre and Velter brought out divergent views. (See below.)

Duverger and **Barré** have arrived at different results as to the arterial retinal pressure from those of Bailliart. Their observations were made with the Thorner ophthalmoscope. Before the arterial lumen at the disc has been entirely compressed, they found the disc becoming paler, which shows that the capillary circulation of the disc is surpressed before the arterial circulation in the retina. Fifty-six cases examined convinced them that intraocular tension is not increased by increased arterial retinal pressure, and that arterial pressure in the eye is not increased by intraocular hypertension. The arterial retinal pressure they find almost the same as the general arterial pressure. Retinal arterial pressure in the normal eye is between 50 and 60 in the minimum, and 80 to 100 in the maximum. In order to estimate the retinal arterial pressure, it will in future, if these results are verified, only be necessary to take the brachial blood pressure and to deduct 2 cm. Hg. from the figures found to allow for the difference in the levels of arm and retina.

Repeating the experiments on retinal arterial pressure of Bailliart, **Velter** believes the principle underlying them to be correct, but that the technic is not above criticism. Rubbing of the piston in the tube of the dynamometer and the employment of a spring in it may help give wrong results. The procedure is painful even under cocain if greater pressure is to be exerted; cocain and homatropin modify the tonus of the eye, and possibly also the circulation; the intraocular tension is lowered by heavy pressure exerted on the eye. His figures for the normal retinal arterial pressure are 35 mm. Hg. for the diastolic and 65 mm. Hg. for the systolic. His figures are somewhat higher than those of Bailliart and lower than those of Duverger and Barré.

In fourteen cases of glaucoma the retinal arterial pressure was in direct relation with the general arterial pressure and not with the intraocular tension. If an increase of arterial tension is noted in glaucoma it is only very slight, and smaller than the probable error of the technic. If it really exists it could be explained by physical laws, as pointed out by Priestley Smith; and it is, therefore, not necessary to assume any regulating peripheral or central mechanisms. Retinal arterial pressure is in direct relation with the general arterial pressure and not with the intraocular tonus. The intraocular tonus is not influenced by arterial pressure.

Magitot had occasion to study the retinal vascular pressure in a case of post hemorrhagic blindness. The patient, a woman of 52 years, suddenly vomited some blood and became unconscious; she fainted the next morning, and a few hours later could neither see nor hear. Hearing returned the next day, but sight only began returning on the sixth day. On the ninth day vision of the right eye was 1 and the field was very restricted; with the left eye hand movements only could be noticed. When the patient was in a recumbent position the retinal veins collapsed at the slightest contact of the dynamometer and pulsated spontaneously. Arterial pulsations appeared on pressure of 15 gm. and disappeared on pressure of 55 gm., corresponding to a minimal arterial pressure of 15 mm. Hg. and a maximal one of 40 mm. Hg., when the initial intraocular tension (Schiötz) of 10 mm. Hg. is considered.

When the patient was sitting up the veins showed the same conditions as in the recumbent position; the arteries pulsated spontaneously and pulsation disappeared on pressure of 20 gm., corresponding to about 10 mm. minimal and 15 mm. maximal. Ultimately the intraocular tension rose to 18 mm. for the right and 16 mm. for the left eye. The veins pulsated spontaneously. On the right the artery pulsated with 30 gm. pressure and stopped with 80 gm.; on the left the artery pulsated under 30 gm. and stopped with 70 gm. The cause of the hemorrhage was possibly a gastric ulcer.

The general arterial pressure was rather low for some time and rose ultimately. The retinal arterial pressure, which was very low in the beginning, soon rose to almost normal figures; a discrepancy thus existed between the two pressures. Because of the spontaneous venous pulsation, the minimal venous pressure must have been very near the intraocular tension. The remarkable difference in the vascular pressures when the patient was examined in sitting or recumbent position gave the impression that the blood column had hardly sufficient power to get to the eye. The blindness and deafness following the loss of blood, and the fainting, are to be interpreted as affections of the organs provided with arterial branches from the same trunk. The optic atrophy is, as in quinin amblyopia, due to the ischemia of the ganglion cells. It is probable that the retinal anemia and damage could have been avoided if the patient had remained recumbent. The Trendelenburg position might be used in a future case, in a preventive way. See also **Bailliart,** under Angiosclerosis.

Traumatic Angiopathy.— Commenting on Staehli's paper on traumatic angiopathy (Y. B. 1916 v., p. 205), **Purtscher** emphasizes that Berlin's opacity seems to depend on pathologic changes in the choroid, while in angiopathy the white spots show a remarkable dependence of the retinal veins and especially spaces. Berlin's opacity appears and disappears very soon after the acci- of those with perivascular lymph dent. In angiopathy the fundus changes never appear before the third or fourth day. They always lie in the innermost layers and often cover the retinal vessels in angiopathy; in Berlin's opacity the vessels stand out markedly against the white background. There is possibly a combination of the two opacities in injuries.

Angioma.—A patient with cavernous angioma of the retina showed at **Brewerton's** examination an oval swelling in the periphery. A congenital faulty development of the retinal capillaries makes these dilate into cavernous spaces, resulting in an oval limited area of angioma. Intraocular hemorrhage was feared. The other eye of the patient had been removed when he was 6 years old because it was blind and painful.

Angiomatosis—Von Hippel's Disease.—The trouble in the left eye of **Gamper's** patient, aged 27 years, began in 1911, when the disc appeared somewhat cloudy and red; the upper temporal vessels were greatly dilated and tortuous with strong reflexes; artery and vein not easily distinguished from one another. In the upper periphery was a round spherical red prominence about 3 to 4 d. d., into which the vessels entered. Gradually white spots in the retina developed, the vessels were bordered by white lines, the retina became detached and vision was lost. Enucleation in 1914.

In the right eye a round red prominence was discovered in 1915 in the upper periphery, symmetrically with the other eye, but at first without any blood vessels. Gradually this symptom also appeared. Vision remained intact to the time of the report, though the condition was decidedly progressive.

Histologic examination of the left eye showed that the beginning of the tumor formation is a convolution of newly formed capillaries with very little tissue between them, the surrounding retina being normal. The thickening of the vessels is greatly due to homogeneous proliferation of the adventitia. In some places the endothelium is also affected. Between the dilated blood vessels glia proliferation with giant cells is to be found, occasionally some cystic spaces and at times a hard fibrous nodule. He looks upon the disease as a telangiectasis of the retina, based on a congenital tendency which also influences the other elements of the picture such as the glia. The retina gradually becomes necrotic and anatomically conditions as in retinitis exudativa are found.

Ditroi's patient, a man aged 30 years, lost the sight of the left eye by iridocyclitis, it having been struck by the tail of a horse. In the right eye, whose vision was 6/7, the upper temporal vessels were greatly thickened resembling one another; the arteries showed bead-like constrictions. In the upper periphery was an 8 D. prominent tumor with uneven surface to which the vessels extended; a smaller tumor adjoining it. Several anastomoses existed between the bessels; one of them in the form of a fine fan-like structure consisting of eight branches. Small yellowish glistening spots were seen above the disc and below the macula. Suspicion of pulmonary tuberculosis; blood examination negative. About two years later vision and field were still good, but the vessels had become greatly enlarged and more tortuous; nodules had formed on the vessels; also new anastomoses. A new angioma nodule had developed at the seat of the eight fan-shaped anastomoses. Retinal degeneration was more advanced.

Houwer's patient, aged 23 years, lost the sight of the right eye after a blow ten years before; 1918 vision of the left eye was failing, 1/60. Fine and large vitreous opacities were present, and in the upper and in the temporal periphery each a group of red knobs was seen, to which strongly dilated vessels extended. The knobs were surrounded by white masses. Large and small white spots in the retina and many clear white glistening points mostly in the region of the macula could be seen. Below was a transparent flat detachment through which glittering spots in the sub-retinal space could be seen. X-ray treatment unsuccessful.

Crigler demonstrated a macroscopic specimen showing a mass of subretinal exudate from a patient long under observation for retinitis exudativa (Coats) or von Hippel's disease. A histologic report is promised. **Becker** has written an inaugural dissertation on arteriosclerotic changes with atheromatons degeneration. See also **Berg** under Pathology,

Spasm of Retinal Vessels.—In two soldiers, **Bussy** observed transitory blindness after concussion. The pupils were wide and did not react; the discs were pale and the retinal vessels greatly contracted. The passing blindness is said to have been due to spasm of the retinal vessels and the resulting anemia of the retina.

Angiosclerosis.—Angiosclerosis of the vessels of the eye in its relation to general diseases is well shown by **Uribe Troncoso.** The magnification produced by the ophthalmoscope permits excellent study of the retinal vessels. Changes found in the retinal vessels allow some conclusion as to the condition of the vessels of the brain, since both organs are supplied by the same trunk. The relation of affected retinal vessels to general diseases, premature arteriosclerosis, heart and kidney lesions is well known. The first stage of the sclerosis is rarely observed, because it gives no subjective symptoms. At this time the vessels are dilated from degeneration of the muscle and elastic fibers, from formation of spaces in the elastica and non-inflammatory swelling of the intima. The arteries are but are at times alone affected.
dilated and tortuous and they pulsate; the veins hardly share in the affection,

Later thinning and distension of the vessel wall are replaced by thickening of the wall and contraction of the lumen by obliterating endarteritis and true sclerosis; the reflex becomes broader, the arteries appear like silver wires and show alternating contractions and dilatations; the veins are indented by the crossing arteries and varicosities are produced in them; the capillaries are tortuous and more numerous; the thickened vessel walls show as white lines and the brittleness of the vessels leads to hemorrhages; optic neuritis and white exudates may follow.

Retinal arteriosclerosis is a precursor or co-symptom of general sclerosis; thrombosis of the retinal artery is often a premonitory symptom of apoplexy; thrombosis of the vein is less serious. Retinal angiosclerosis is generally associated with kidney lesions, but is not always a sign of kidney affection. The retinal changes are degenerative and not inflammatory. Sclerosis of the choroidal vessels is of different diagnostic and prognostic value, and is mostly the result of syphilis, though found also in diabetes and nephritis.

Bailliart's patient, with arterial hypertension in the retina, a man, aged 33, had vague visual complaints, apparently due to some disturbance of the accommodation. In both fundi the retinal vessels were tortuous; small peripapillary hemorrhages were found in the right eye, and small white spots in the left macula. Pressure on the eyes produced no venous pulse, but a pressure equivalent to 65 mm. produced arterial pulse which did not disappear under pressure of 100 mm. The discs margins were slightly blurred. In the urine no albumen, no sugar. He considers the case one of beginning azotemic retinitis. Pressure on the normal globe will always produce pulsation of the retinal vessels. The high pressure necessary in this case to produce pulsation is a valuable early objective symptom in hemorrhagic retinitis and especially in azotemic retinitis.

The right disc of **Heed's** patient, a man, aged 50, appeared pale, the margins irregular and an exudate covered the surface. The veins were dilated and tortuous, the arteries showed advanced sclerosis; the temporal artery appeared as a solid white line and the other arteries as chalky white lines with a central blood column. Physical examination showed pleurisy, emphysema, an enlarged heart and arteriosclerosis. Blood Wassermann negative. In the discussion, Zentmayer thought the case rather one of perivasculitis and post-neuritic atrophy.

Perivasculitis.—The case of perivasculitis reported by **Peter** was that of a woman, aged 61, whose sight of the right eye began failing three years. Vision, 1/10. The disc was well defined, excepting at the upper and temporal borders. The veins were full and tortuous; the arteries were tortuous and the light streak was absent. The superior temporal artery showed marked perivasculitis in the form of a broad ribbon-like structure, through which a narrow blood column was visible. About 3 d. d. from the disc the vessel disappeared in a retinal haze, and appeared beyond as branches surrounded by narrow borders of white. The macular branch was lost in the hazy macula. Surrounding the macula was a stellate figure, below it minute round hemorrhages. Clinical diagnosis of chronic interstitial nephritis was made. Embolic and thrombotic forces can be eliminated, and the condition was thought to be perivascular change of arteriosclerotic origin, associated with chronic nephritis. In the discussion de Schweinitz alludes to a similar case reported by him, and refers to the fact that such vascular changes are found more pronounced in the colored race.

Obstruction of Retinal Artery and Vein.—It is reported by **Veasey** that a patient, aged 30 years, suddenly lost the vision of the left eye. The upper half of the disc was pale, the disc was markedly less translucent, the cup being apparently covered by a thin veil. All upper arteries were mere threads, no current in them; vein one-third the normal size; upper half of the retina was opaque, no cherry spot in the macula. Lower field was entirely abolished, but fixation point preserved. Massage, nitro-glycerin and iodides restored vision in five days; edema began to clear later. Two months after the attack vision was normal, but the lower field remained abolished. Patient had a systolic murmur near the apex.

A tentative diagnosis of embolism of the central retinal artery was made by **Orcutt** in a man who became suddenly blind two weeks before. The arteries were narrow, the fundus white and a bright red spot was in the macula. High blood pressure and albumin in the urine.

In **Juler's** patient an electric flash was followed by embolism of the central retinal artery. On the temporal side of the disc the retina, supplied by a cilio-retinal vessel, looked healthy. The caliber of the retinal arteries was the same as those of the other eye. Two hours after an electric flash six feet from him the eye became blind gradually; sight was restored one hour later, but when awaking after a sleep the eye was again blind. Diminished force of heart action during sleep, in the patient who had an extensive but probably congenital heart lesion, is said to have enabled blockage of the artery to become complete.

On the eighth day after the onset of influenza, a woman, aged 22 years, the patient of **Goldenburg** felt something suddenly happen in her right eye. The eye was blind, it felt stiff and later it turned out. Three months later fingers could be counted at two feet in the upper temporal field; disc showed primary atrophy; a cloudy greyish-pink area 2 d. d. noted from disc temporalward beyond macula. Arteries were markedly narrow except the upper temporal branch, which was half the normal diameter. Many hemorrhages in the region of the macula and on the nasal side. Over bifurcation of the artery a small greyish dot was noticed of which it was undecided whether it was in the vessel. Heart and vessels were negative, but lungs still showed some consolidation.

The left eye of **Strebel's** patient, a woman, aged 48, who had mitral insufficiency following rheumatism, suddenly became blind. In the macula a milky opacity in the center of which a horizontally oval, brown-red spot, much sharper defined above than below and showing the normal foveal reflex. Marked perimacular radiation was seen. Under massage of the eye, digitalin, amyl nitrite and paracentesis, the arteries began to fill and to show pulsation upon pressure on the globe. The central scotoma disappeared and field became normal. There are fifteen other cases of cure on record. In two other cases of embolism he found sclerosis of the retinal and choroidal vessels the cause for the trouble, and in both the embolism was the precursor of apoplexy from which the patients died. The paper contains a good review of the literature.

Half an hour after waking, **Callan's** patient with occlusion of the central retinal artery discovered the blindness of his right eye. Three hours later the pupil was larger and reacted sluggishly, the disc was hazy and the arteries seemed reduced in size; edema of the macula and cherry red spot were seen.

Paracentesis was done at once and bandage applied. Field and fundus were normal the next morning.

Among **Kapauner's** twenty-one cases of embolism of the central retinal artery, seven were total, two incomplete, three of one branch only, six with persistent cilioretinal vessel and one thrombosis of the central retinal artery; two were due to arteriosclerosis from lead poisoning. Nine times endocarditis, one time arteriosclerosis, twice rheumatism, three times nephritis and once an old pleurisy were the cause; five times the etiology was unknown. In a survey of his and Bentrup's cases, in all thirty-three, endocarditis or rheumatism was responsible for 54.5 per cent, arteriosclerosis for 18.2 per cent, chronic nephritis for 9.1 per cent; syphilis played no etiologic rôle.

Two months after a blow to the temple, **Wibaut** found a partial occlusion of the retinal vein in his patient, and assumes a connection between it and the injury. **Oloff** reports a typical case of occlusion of the central artery in a 19-year-old patient, which showed improvement of fundus condition and vision after an injection of 5 mg. of old tuberculin. **Charles'** patient, a coal miner, with embolus of the central artery, dropped dead three weeks later. **Kraupa** has written on the treatment of embolism of the central artery of the retina. See also **Wessely** and **Guyton.**

Hemorrhages.—A man, aged 69, seen by **Bane,** had flame-shaped hemorrhages below and near the right disc, more in the lower nasal quadrant; the disc was swollen. Physical examination was negative. In the discussion arteriosclerotic change in the vessels of the nerve behind the disc was suggested.

Gonzalez reports five cases of retinal hemorrhages following influenza, and gives illustrations of the different types. Marked improvement and cure followed sweats and local application of heat.

Serious retinal hemorrhage due to pregnancy is reported by **Augstein** in a woman, aged 26. During her first pregnancy, though in excellent health, hemorrhages in the retina destroyed the left eye and compelled enucleation. Three years later during her second pregnancy, severe retinal hemorrhages occurred in the right eye. Delivery was induced and rapid absorption of the hemorrhages with normal vision followed. In the first eye thrombosis of the central vein had probably supervened; in the second eye only retinal hemorrhages. Between the two pregnancies the patient developed iridocyclitis in the healthy eye. Augstein assumes that the eyes of the patient showed special vulnerability, allowing the toxins of pregnancy to produce the affection.

Two days after onset of influenza the patient of **A. S.** and **L. D. Green,** a man, aged 51, was unable to see a fire with the right eye. There was gradual improvement to 20/40. The disc was congested, the margins were blurred and the vessels near the disc appeared under a slight haze. Arterial twigs were tortuous and a few punctate hemorrhages between macula and disc and some yellowish spots in the macula could be seen.

From a study of the literature, **Strebel** concludes that the retinal hemorrhages of the new-born are quite well known, and that the hemorrhages in retina of the mother have not received the deserved attention. He reports two cases of hemorrhage in the macula in two healthy women of 34 and 37, respectively. The hemorrhages developed apparently shortly after normal delivery, and became noticeable as a greenish or reddish round shadow in the center of the field of the affected eye. Absorption was rather slow; began in both cases from the temporal side, and left a central scotoma behind. In one of the cases the other eye showed a congenital macular coloboma, cataracta coerulea, paralysis of the oculomotor nerve.

Retinal hemorrhage from intestinal intoxication, with complete recovery is reported by **Claiborne** in a man, aged 56, who suddenly noticed disturbance of vision of the left eye. Several large hemorrhages were seen around the disc. Arterial tension was slightly elevated; urine was strongly acid and contained excessive indican, hyaline casts and many calcium oxalate crystals. Feces were highly acid with indol 5 plus. Enemas and diet produced rapid absorption and normal vision.

Waterman reports the case of a man very carefully studied with regard to focal infections and general disease, without having any light thrown upon the cause of his retinal hemorrhage, which had affected first his right eye and four months later his left, with complete obscuration of vision. He was found to have suffered from progressive constipation with fecal accumulation. The urine was highly acid and loaded with indican. He was treated persistently for the copremia by rest, diet, thorough flushing of the colon, etc. At the end of a year he was reported to have normal vision in each eye.

Hemorrhagic retinitis from infected tonsils, in both eyes, but worse in the right one, in a medical student is reported by **Looper**. Physical examinations, including Wassermann, were negative. One week after removal of the tonsils improvement began and vision was normal after one month. **Bohemier** has written on retinal hemorrhage.

Pre-retinal Hemorrhage.—Pre-retinal hemorrhages are less serious than intra-retinal ones, **Merigot de Treigny** declares. In four or five months absorption is almost complete, if arterial tension and kidney condition are watched. General or renal arteriosclerosis, arterial syphilis, heart and kidney affections are the causes. Hemorrhages from leukemia or hemophilia are more serious. Miotics are indicated when the tension is increased. To reduce the arterial tension is an important part of the treatment; reduction of fluid intake and purgatives are advisable. Milk and vegetable diet, diuretics, chloride of calcium, organic iodin preparations, organic extracts, etc., are of value, together with mental and physical rest.

Juvenile Recurrent Hemorrhages.—After a review of the literature and the etiology of juvenile recurrent retinal hemorrhages, **Herter** reports on four cases of this affection. Two were in all probability due to tuberculosis, in one no cause could be found and in another one myocarditis was the only possible cause. In the two tubercular cases tuberculin was used successfully, and in the other two K. I. was used, which in the case of unknown etiology was combined with careful tuberculin treatment. In all cases 2.5 per cent saline solution was given subconjunctivally. See also **Looper,** under Hemorrhage, and **Friedenwald**, under Retinitis Proliferans.

Retinal Tuberculosis.—The left eye of **Buck's** patient, a man of 21, with hemorrhages of tubercular origin was almost totally blind from neuro-retinitis with hemorrhages two years before, and showed the typical picture of proliferating retinitis with a broad bluish-white band running from the upper nasal to the lower temporal quadrant, hiding the disc. In the right vitreous dust-like opacities and perivasculitis along the superior and inferior temporal veins were found. A few days later a large hemorrhage into the vitreous occurred, apparently from the upper temporal vein. Under "coagulosa," calcium chloride, calcium iodide, sweats and tuberculin injections, the eye cleared so that two weeks later vision was 20/25; two other hemorrhages in the right eye followed and each time treatment was successful. Finally the right eye had normal vision and irregularly contracted field, and the left one showed detachment of the retina, and the vitreous filled with organized material containing new blood vessels.

The paper of **Jackson** and **Finnoff** on tuberculosis of the retina is important because it contains a study of the early lesions of tuberculosis of the retinal vessels, accompanied by detailed drawings, and because the cases could be observed over a period of time. The first patient, a man, aged 28, came under observation for photophobia and lacrimation caused by grey, deep corneal infiltrations in both eyes. Fundus examination revealed in the right eye greyish oval patches of exudate covering some of the vessels. All examinations proved negative, but tuberculin injection was followed by a slight haziness over one of the vessels, apparently a focal reaction.

After it was learned that the patient was getting his milk from a suspected tuberculous cow, an injection of bovine tuberculin was given. Small hemorrhages and new patches of exudate followed it. With continued tuberculin treatment the corneal opacities became gradually smaller, and numerous flame-shaped hemorrhages and beginning retinitis proliferans were seen. The large exudate seen before in the left eye disappeared. Later a large subhyaloid hemorrhage in the right eye and hemorrhages near the disc, and the vitreous hazy; the only change in the left eye was slight variation in caliber of the lower nasal vein. Gradually in the right eye appeared symptoms of proliferating retinitis and patches of exudate on the branches of the upper nasal vein. Vision, R. E. 0.33, L. E. 1.4.

The second patient, a man, aged 33, noticed a spot before the left eye. In the macula twenty or more thin greyish-white spots were found, arranged in lines radiating from the fovea; veins were dilated and tortuous; flame-shaped hemorrhages. Old lesion in the lung was found, but nothing active. After 1 mg. of old tuberculin general reaction with nausea, but no focal reaction. Small doses of tuberculin were followed by gradual disappearance of all symptoms of retinal disease.

The third patient, a man, aged 35, lost the sight of his left eye from vitreous hemorrhage two years before, but the eye was well again two months later when the right eye became blind, and recovered after four months. Of late return of hemorrhages and vision of the right eye, fingers at 1 foot; in the extreme temporal field, L. E. 1.1. The right eye showed greyish-red reflex in all directions and floating masses. The left vitreous was slightly hazy. Infiltration at the apex of each lung was found. General treatment, but no tuberculin was ordered. One month later the right eye showed a yellowish-grey reflex, but no hemorrhages. Of the early cases reported by the one observer a fresh hemorrhage occurred in the left eye of a lady, and whitish masses could be seen well forward on the nasal side. Finally fresh hemorrhages occurred and for two years the disc and the fundi have been invisible behind masses of retinitis proliferans.

Retinal tuberculosis begins with white infiltrations in front of the retinal vessels, mostly the veins; later perivasculitis and greatly altered caliber can be seen. Hemorrhages occur; they may be small and clear up in the end, or may be massive and be followed by retinitis proliferans and greatly reduced vision. At times the eye grounds remain visible throughout the disease and small white dots as in renal retinitis are seen. Both eyes are often affected and the course is protracted. Cases without pyrexia or extensive tuberculosis in other parts do well under small doses of tuberculin. General treatment is necessary.

Natale's patient, a girl of 16, in good health, whose brother showed symptoms of tuberculosis, suddenly noticed diminished vision of the left eye, 1/20. In the periphery fresh small hemorrhages were found. A greatly pigmented focus of old choroiditis was seen on the superior temporal vein above the macula; from it thin white streaks followed the direction of the vessel and proliferating tissue projected for a short distance into the vitreous. On the disc connective tissue covered the exit of the vessels. Dirty-white fresh foci of periphlebitis about 1 d. d. long and as wide as a large vein were found on a branch of the superior temporal vein, and on the inferior temporal vein more toward the periphery. Under tuberculin treatment the foci diminished in number, the hemorrhages became absorbed and vision was finally normal.

Proliferating Retinitis.—The patient of **Bentzen,** a man, aged 26 years, showed severe anemia and epistaxis, one month after being infected with lues. At this time intense hemorrhagic neuro-retinitis developed in each eye. During the next year vitreous hemorrhages, detachment of the retina, cataract and glaucoma followed in the left eye. In the right eye the neuro-retinitis disappeared, except in the center, where pigmentation and atrophy showed up. From the center of the disc several white floating strands projected into the vitreous beyond the upper disc margin.

Schlivek's patient with proliferating retinitis, a man, aged 25 years, accidentally discovered seven years before the poor vision of his right eye. The lower nasal quadrant only of the disc was visible, but the margin was not sharp. The rest of the disc was covered by an irregularly cone-shaped mass, extending to about the center of the globe. It was white and fluffy and had numerous blood vessels; some were dark red and others showed marked perivasculitis. Some vessels extended backward, and then turned on the retina; others extended from the apex a short distance only and then turned over to the retina. Where these vessels continued on the retina it was decidedly elevated, and from the vessel numerous fine arborescent vessels extended backward. Above and to the nasal side of the disc a greyish-white membrane with new vessels was seen. From the apex of the cone-shaped mass another one started, with several extensions, some of which spread into diffuse fibrillated areas. Some retinal vessels showed perivasculitis; chorio-retinitis was present in the periphery and pigment changes in the macula. The left eye was normal; Wassermann and Noguchi tests were negative; no tuberculosis.

In **Gertz's** patient with proliferating retinitis the membrane formation was less marked, but blood vessels projected into the vitreous, forming a network of fine vessels about 4 to 5 D. in front of the retina. Some of the larger vessels were lying in folds of the retina.

The right eye of a girl, aged 12, the patient of **Eigler**, showed a white area and black pigment spots along the lower temporal vessels. White streaks connected the area which was in front of the retina with the vessels. The condition, dating from infancy, was thought due to a hemorrhage at birth. It might be classed as proliferating retinitis.

Zentmayer showed an adult, who five years before attempted suicide by shooting himself in the temple. The right eye showed a mass of connective tissue overlying the position of the disc; it extended upward several d. d. and into the vitreous for 5 to 6 D. The lower and temporal borders were rounded, and a broad band of similar tissue extended toward the temporal region. Considerable pigmentation of the borders and surface of the mass was noticed. Emerging from the edge of the mass and curving about its rounded border were newly formed vessels. The condition is considered a proliferating chorio-retinitis, with partial evulsion of the optic nerve.

The hemorrhage into the left vitreous of **Friedenwald's** patient, a young man, was absorbed rapidly and connective tissue developed in the upper periphery of the retina; a retinal vein entered the mass of connective tissue. In the cases observed by Friedenwald, cork-screw vessels were found in some and connective tissue formation in all. Tuberculosis as a causative factor is alluded to.

Matthews and **Crawley** showed a case of proliferating retinitis. In the discussion Crawley mentioned that he had seen hemorrhage in the vitreous and retina clear up after subconjunctival injections of cacodylate of sodium, and the view prevailed that the condition mostly occurred in young male adults who were clinically the subject of tubercle. See also Tuberculosis and Juvenile Hemorrhages.

Retino-Choroiditis Juxta Papillaris. (Jensen).—In a case of this kind seen by **Lodberg** in a woman, aged 22, typical ophthalmoscopic findings and field were found, together with a star-shaped figure in the macula. Gradually the star figure disappeared almost entirely and vision improved. No albumen in urine.

Gertz's patient with juxta-papillary disease was a man, aged 22, with disturbance of vision for three weeks. Typical field defect was found. Vitreous opacities were present, and at the upper nasal margin of the disc was a typical cotton-like exudate about disc size. The superior nasal artery passing through the exudate emerged very thin and contained only a thin blood column.

In the military hospital at Kiel, **Schertlin** observed three cases of retino-choroiditis (Jensen). All showed the typical picture of a whitish or yellowish-white prominent focus, veiled retinal vessels and vitreous opacities with sector-like field defect and tendency to recurrence. In two of the cases a diagnosis of tubercular choroiditis had been made at first. In two cases the foci were more than 2 d. d. removed from the disc. In one case a marked increase of tension was observed, which, since precipitations were observed only later, is blamed on circulatory disturbance from the violent inflammation. In the first case the focus developed out of three small light grey, later yellowish, confluent foci. After an injection of old tuberculin the patient showed general subjective and local reaction. General reaction also occurred in the second case after tuberculin. In the third case, which at first looked like uveitis, the focus appeared after tuberculin injection. Schertlin is inclined to consider the retino-choroiditis (Jensen) as a comparatively benign solitary tubercle affection of the retina.

Peripheral Communicating Vessels.—Two years before **Salus** reported in the Prague Med. Jr. a case (Fig. 12) in which some of the retinal veins of one eye had lost their connection with the central vein, penetrating into a retinochoroiditic focus. A part of the retinal venous blood thus emptied itself into the choroid. The inferior temporal vein contained only a fine thread of blood for about 1.5 d. d., after which it communicated with a large vein which, coming from below, ran towards the choroiditic focus, where it disappeared. Similarly the superior temporal vein, but in this case communication with the central retinal vein had remained wide. Two small retinal veins also went to the focus. In the case he now reports (Fig. 13) a 3 d. d. round, yellowish-white focus in the macula contained pigment dust, and was surrounded by a pigment ring. The edges were somewhat elevated, but the center seemed depressed, and here the choroidal vessels could be

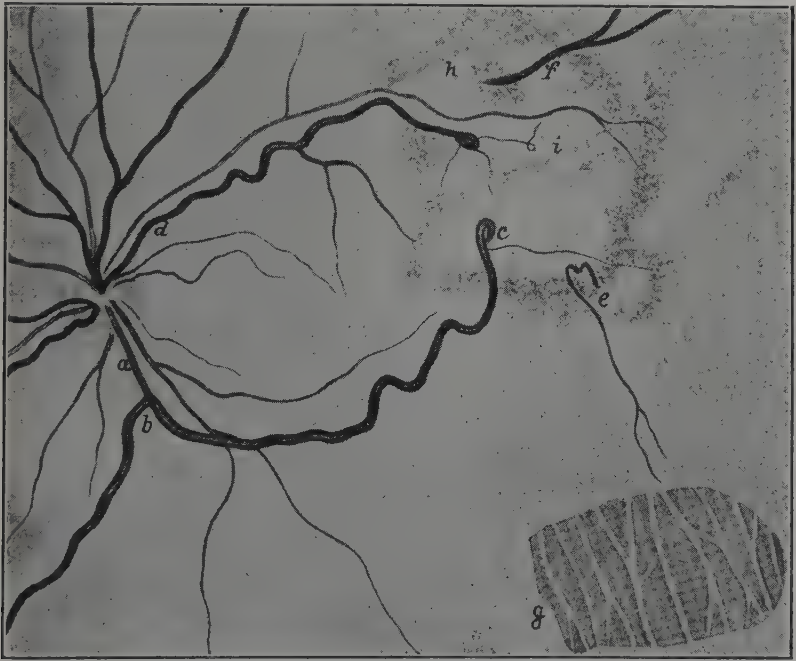

Fig. 12. Retinal veins penetrating a retino-choroiditic focus (Salus). (a) Contracted part of inferior temporal vein. This part joining larger trunk at (b) and passing to choroid at (c). Superior temporal vein (d) passing to choroid. The peripheral portion (f) also enters choroid. (g) Defect of retinal pigment layer. (h) and (i) Choroidal vessels.

seen. A branch of the superior temporal vein, markedly distended and slightly tortuous, running above the focus, and making a sudden turn downward disappeared in the focus with the formation of a small hook. At the bend the former continuation of the vessels was visible as a thin whitish branch, which gradually increasing in width, was seen to empty into the superior temporal vein. Similarly a fine venous branch coming from below disappeared in the focus. According to the theory of Leber, the veins passing at the margin of the focus were probably affected by the inflammatory process and an occlusion of the veins occurred; then the scar became vascularized by small vessels from the choroid which entered into connection with very fine capillary retinal veins.

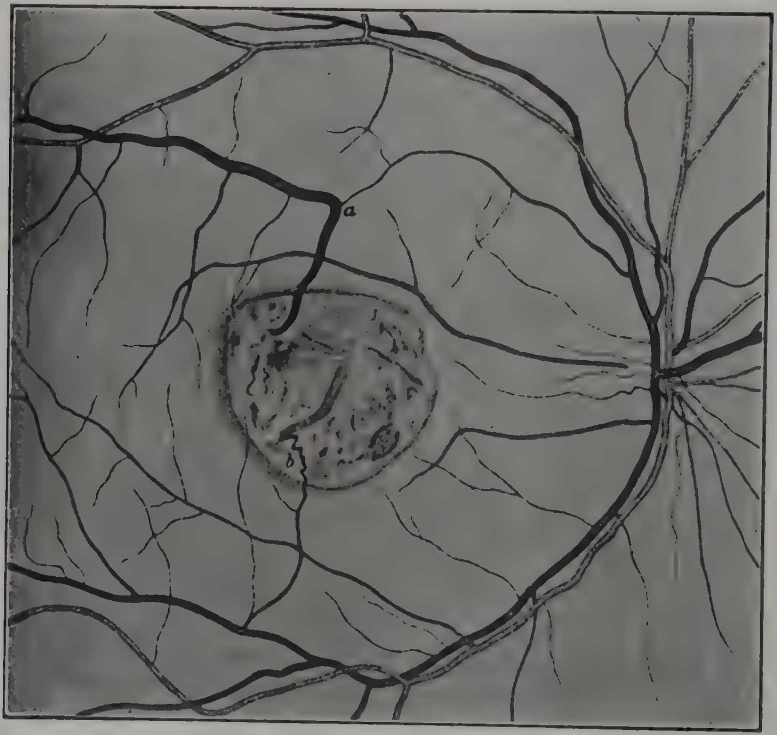

Fig. 13. Retinal veins entering the choroid (Salus' second case). Superior temporal branch bends at (a) where its former continuation is seen greatly contracted. (b) Fine branch from below joins a choroidal vessel.

Exudative Retinitis.— **Roenne's** patient with exudative retinitis (Coats), a man, aged 74, had his left eye affected with complicated cataract. The right one was diseased for one year; in the center and in the periphery snow white, partly prominent subretinal exudates to the extent of several d. d. could be seen.

All ten cases of exudative retinitis of **Holm** showed exudate in the outer retinal layers and some subretinal exudate. His first two cases resembled Coats' group one, the third one belonged in group three of Coats. The next two cases looked like circinating retinitis. The sixth case was in a patient with lymphogranulomatosis whose eyes could be examined histologically three years after symmetrical exudation and hemorrhage had been found in each macula. The histologic picture was typical of external exudative retinitis and showed small perivascular foci of epithelioid cells and leucocytes in the retina, choroid and orbit. The next case was like the sixth one. In his eighth case the changes in the macula were scar-like with no hemorrhages, but showed some irregular pigmentation. The ninth case, belonging in group 1 of Coats, was that of a child which, three years later, had normal vision and field in spite of considerable exudate and detachment. His tenth case was a child with congenital syphilis. The author believes that a group of syphilitic cases can be separated in the disease and that a senile group be added with a rarely prominent exudate limited to the macula. See also **Berg,** under Pathology.

Syphilitic Neuro-Retinitis.— Among 460 patients with syphilis in Camp Lewis, **Wuerdemann** found fourteen with optic neuritis, and of these only four complained of diminished vision. Five pictures, representing different degrees of neuro-retinitis, are given in contrast with a typical one of choked disc observed fourteen hours after fracture of the skull. Of the cases illustrated, three made perfect recovery, no objective symptoms remaining. In the fourth the disc was ultimately white, and showed the characteristic blurred depression with contracted blood vessels. The treatment of optic neuritis is etiologic and urgent; the patients must abstain from use of the eyes and must be protected from light. Arsphenamin, mercury and iodides, together with free diaphoresis, are indicated. No bad effect from arsphenamin has been observed in Camp Lewis, and the optic nerve changes must be explained as due to irritation by the suddenly released toxins of the spirochete. The discovery of neuro-retinitis in patients unaware of their infection shows the importance of the ophthalmologist as a diagnostician.

In **McCaw's** patient with syphilitic neuro-retinitis, demonstrated three years ago (Y. B. 1917 v., p. 128), the condition had remained unchanged until recently, when the left eye showed an aneurismal dilatation of one of the lower arteries; the right one showed proliferating retinitis. In the discussion Jackson commented on the great resemblance of the condition to angiomatosis, only the clusters of enlarged blood vessels were missing; the greatly thickened retina presented a rare form of syphilitic affection of the retina; no evidence of syphilitic etiology has been found in angiomatosis.

Syphilitic Chorio-Retinitis.—Masuda characterizes syphilitic chorio-retinitis as follows: Vitreous opacities exist of various intensity. The fundus may appear normal, but closer examination will show two types of changes. In the one class the posterior part is mostly affected; around the disc and the macula a diffuse grey-white opacity may be seen, which will leave behind grey-white spots of atrophy. In these cases ring scotoma is found. In the other group the peripheral fundus shows a diffuse opacity which leaves behind atrophic spots with irregular pigmentation. The cases of the first group are rare; he found only two in twenty cases. Complications with hemorrhages seems to be rare; he has seen only one case. In another very rare type of cases, the fundus is characterized by comparatively large, yellowish-white, slightly raised patches lying behind the retinal vessels.

Chorio-Retinitis.—A rare form of bilateral choroido-retinitis in a 6-year-old child, is reported by **Henderson.** The right eye showed a brilliant white exudate on the macular side of the disc; in the center of it was a circular pigmented patch. Later the left eye showed a similar symmetric patch accompanied by extensive exudation and some hemorrhages. Wassermann and tuberculin negative. Condition is thought to be due to some vascular lesion of the choroid.

Retinitis Centralis. — Though frequent, the scotoma of retinitis centralis is often difficult to elicit, **Oguchi** says; it can be more easily done by the use of the stenopaic slit. Yellow appears as white, blue will be recognized for a long time and often appears greenish; red and green become dark. The accessory sinuses, especially the ethmoidal cells, produce an affection of the macular region in some cases. The scotoma can be more easily demonstrated after the patient has been dazzled or has spent some time in the dark.

Retinitis in Pregnancy.—Complaint was made by **Pocock's** patient, aged 35, of dim vision during the seventh month of pregnancy; R. E. 6/60; L. E. fingers; no albumen; fundi showed "albuminuric retinitis" with considerable edema of the retina, more in the left one. Labor was induced, and sight improved subsequently. At the same time Pocock tells of another woman who began losing the sight during pregnancy, but was allowed to go to term and never recovered her sight.

Fernandez dwells on the importance of cooperation between obstetrician and ophthalmologist, and shows how with a correct diagnosis of the eye condition a proper prognosis as to the life of the mother can be formulated, and the proper actions decided upon to prevent serious damage to her eyesight. The different forms of affection of the eye are enumerated, and the difference is pointed out in the prognosis of retinitis during pregnancy, the consequence of toxemia, or of preexisting renal conditions and arteriosclerosis. Eye affections are important indications for inducing premature labor or abortion, but this indication varies with the date of the pregnancy, the eye condition and the underlying cause. Future pregnancies should be avoided for at least two years after the urine has become normal. Edema of the lids and conjunctiva and subconjunctival hemorrhages and other eye affections have been observed as the result of pregnancy nephritis.

Eye symptoms, when occurring during pregnancy, are an important guide to the accoucheur as to the future handling of the case, **Peter** declares. Eye changes from an exacerbation of chronic nephritis are an absolute indication to terminate pregnancy, without regard to the stage of the pregnancy, in order to prolong the life of the mother. In toxemia of pregnancy the prognosis is less serious and permits more conservative action, which will depend upon the stage of the pregnancy, the condition of the urine, the arterial tension and the eye condition. Subsequent pregnancies may pass without renewed eye symptoms. In uremic blindness, even without convulsions, delay in terminating pregnancy is unwise. Eye ground studies should be a part of the routine study in pregnancy when urinalysis and blood pressure phenomena show an abnormality of nephritic function. See also **Augstein**, under Hemorrhage, and **Strebel.**

Renal Retinitis.—Analyzing the fundus changes in nephritis, **Bettray** found the typical fundus changes only in eight of twenty-one cases of albuminuric retinitis, in part combined with swelling of the disc. In three cases no albumen was found in the urine. In a case of nephritis of pregnancy uremic amaurosis was followed by chorio-retinal changes. In three cases of chronic nephritis only vascular changes and numerous retinal hemorrhages, and in one case vitreous opacities were found. In one case chronic nephritis was considered the cause for retrobulbar neuritis. Three cases of unilateral choked disc and one bilateral were thought caused by nephritis.

Starting from the fact that lipoids are found in the urine of a number of nephritics and that some of the white spots in albuminuric retinitis are due to lipoids, **Rollert** and **Finger** endeavored to find whether the lipoids appear in the eye and the kidney under the same conditions, and whether this can be demonstrated clinically. In a number of acute nephritics lipoids appeared in the urine at the same time with the typical deposits in the retina.

The appearance of lipoids in the kidney and in the eye corresponds to coordinated processes which can only occur when pathologic changes of the respective organs and disturbance in the metabolism are present. This latter shows easiest by a cloudiness of the serum (pseudochylia), which is associated with an increase of the neutral fats, the cholesterin, and which stand in relation to the edemas and the high albuminuria. After the disappearance of the pseudochylia and the hypercholesterinemia, no new deposits occurred in the eye, and probably also not in the kidney; at the same time edema and albumen disappeared. The examination of the serum and of the lipoids of the urine allows a prognostic conclusion as to the white spots in the retina as far as they are made up of lipoids.

Kershner's case of hemorrhage in Bright's disease is most remarkable on account of the complete and rapid absorption. A man, aged 28, suddenly experienced toothache-like pain in both eyes. The right eye showed optic neuritis with a few hemorrhages along the vessels. In the left eye the nasal half of the disc was covered with blood; from the disc reaching to the nasal side was a roll-like hemorrhage projecting into the vitreous 3 to 4 D.; the color of it was deeper than that of the fundus, except for three irregular, greyish-white areas where the folds merged into one another. A day later a subhyaloid hemorrhage extended from the left disc upward. Later both eyes showed stellate exudate about the maculae and the left one flame-shaped hemorrhages. On the eighth day no view of the left fundus was had because of the grey haze. On the next morning the right neuritis was decidedly improved, the left fundus was visible, the disc was normal and all hemorrhages were gone except the subhyaloid one. Twenty-four hours later both fundi were normal except for the subhyaloid hemorrhage in the left eye, which gradually diminished in size. In the urine albumen, blood, hyaline and granular casts.

Clapp's patient, with a typical albuminuric retinitis, a man, aged 18, had normal fundi in 1914. In January, 1919, he complained that vision had been defective since he had acute nephritis in 1918. Pupils were slightly dilated, vision 20/200. In the right eye the disc was slightly fuller with beginning pallor, the vessels full and tortuous. In the macula was a small round circumscribed pearly white area near the circumference of which was a small amount of pigment. Surrounding this small, slightly depressed area was a large yellowish-white area larger than the disc; irregular pigmentation was seen between the central and peripheral portions. From the small central area very fine white lines, probably connective tissue trabeculae, extended over the larger yellowish-white area. Superimposed over the pearly white center were some very fine droplets suggestive of fat drops. Above and below the large yellow area were fine yellowish exudates. The left eye showed similar but more recent changes; the nerve was more blurred and there was slightly more retinal edema; the pigment was less pronounced; the small exudates above and below were also fewer. Wassermann was negative and the clinical diagnosis acute parenchymatous nephritis.

Among 22,000 troops vaccinated against typhoid, **Bussy** reports five developed eye lesions, suggesting the advisability of making blood-pressure and urine examinations before vaccination. One patient developed albuminuric retinitis, another one hemorrhages in each retina and the other three had herpes of the cornea. See also Detachment.

Diabetic Retinitis.—The paper of **Cantonnet** dwells on the frequent coincidence of chronic nephritis and diabetes and refers to Onfray's paper on diabetic retinitis (Y. B. 1918 v., p. 150). Exact diagnosis is necessary for efficient treatment.

Circinate Retinitis.—In the case reported by **Friedenwald,** the patient with circinate retinitis showed marked edema of the retina with numerous hemorrhages about the macula. All physical examinations were negative.

Wada reports a typical case of congenital circinate retinitis in the right eye of a man, aged 23. Wassermann and von Pirquet were negative.

Reporting an atypical case of circinate retinitis, **Dameno** declares sclerosis of the retinal vessels to be the cause of the disease. The sclerosis may develop in any vessel or capiliary of the retina, preferably in those of the nerve layer, and it produces the typical form when the group around the macula is affected. The hemorrhages and exudates are products of the sclerosis, and are mostly situated in the inner nuclear layer, but may extend into the external plexiform layer and even into the sensory epithelium.

Angioid Streaks.—Exhibiting a patient with extensive angioid streaks in the retina, **Brewerton** declares them not to be due to hemorrhages, because he cannot imagine that blood follows such lines. In the discussion Lister believes the streaks to be vestiges of vessels, along which exudate and secondary pigmentation had accumulated. Holmes Spicer mentioned a brother and sister with the identical condition in all four eyes, and the view forced itself on him that the lines were essentially blood vessels. **Koefler** has described this condition.

Retinitis Punctata Albescens.—The patient of **Agatston** with retinitis punctata albescens, a girl aged 19, had brief difficulty in seeing when coming into a room from a bright light. Vision 20/70. Fields were normal and the fundi were uniformly studded with small white spots resembling verrucae of the lamina vitrea. No blindness or night blindness in the family.

Nishioka observed retinitis punctata albescens in a man, aged 20. The white spots were about the macula, not in the lower part of the fundus, and seemed to be connected with the blood vessels. Hemeralopia, reduced visual acuity and a negative ring scotoma were present.

Friedenwald's patient, a colored woman, with bilateral retinitis punctata had recent hemorrhages in the right eye. The spots were small, white, sharply circumscribed and, in places, confluent. Vision of the left eye was very good. The condition is considered one of a chronic degenerative nature, due to arteriosclerosis.

Oguchi's Disease.—As a form of retinal degeneration, **Tomosi** discusses Oguchi's disease and thinks it is mostly found in the male, two out of eleven cases having been in women. The condition is due to congenital anomaly.

Pigmentary Degeneration.—Retinitis pigmentosa may be looked upon as an abiotrophy of the retinal neuro-epithelium, **Collins** declares. Pathologic examination of eyes with retinitis pigmentosa shows no sclerosis of the choroidal vessels, but a primary degeneration of the rods and cones. The condition being hereditary, the degeneration might be described as an abiotrophy. The increase of the retinal neuroglia is similar to that met in various forms of neuronic abiotrophy. Retinal pigmentation is caused by the pigment migration through the limitans externa, after the degeneration of rods and cones has taken place. The migration is a probable consequence of the physiologic capacity for movement of the pigment.

The light-colored dots seen on the retina and the hyaline nodules on the disc are due to hyaline degeneration of pigment epithelium cells, and of the neuroglia in the disc. The generation of the neuro-epithelium commences where it is first developed; the macula is last involved because last developed. Night blindness is due to disturbance in that part of the retina which in the dark-adapted eye is most sensitive to light, 10 to 20 degrees from the fovea. Deafness and affections of the nervous system in retinitis pigmentosa are also due to abiotrophy.

The right eye of **Knapp's** patient, aged 28 years, with bilateral subluxation of the lens showed advanced chorio-retinitis pigmentosa of the kind seen at times to follow couching. In the discussion Weeks suggests the possibility of unilateral retinitis pigmentosa. Among the soldiers in Camp Sevier, **Kershner** found six with pigmentary degeneration and one with rupture of the retina. **Marbourg** presented a typical case of retinitis pigmentosa, with night blindness and contracted fields, in a deaf and dumb patient.

de Wilde examined the family history of 167 patients with retinitis pigmentosa. In 22 per cent the parents were related, while in Holland normally only 1 to 3 per cent of the marriages are among relatives. Among the 6,000,000 Dutch there are about 200 with retinitis pigmentosa; but fifty-two of his patients had already transmitted the disease thirteen times to children or grandchildren.

Mueller has observed two cases of retinitis pigmentosa complicated by glaucoma, and found six others in the literature. The glaucoma is a consequence of the retinitis; the congenital tendency exists in both. Individuals with a tendency to nervous degeneration are liable to have pigmentary degeneration, and the glaucoma may be due to circulatory disturbances and to a modification of the vascular innervation.

Knorr's patient with retinitis pigmentosa presented pigmentation at the periphery, optic atrophy, night blindness, ring scotoma and posterior cortical cataract. Little change in the condition had occurred during the twelve years of observation.

Other Retinal Degenerations.—The retinal degeneration following presence of an intraocular foreign body reported by **Hudson** was characterized by folds of the internal limiting membrane of the retina as a result of contusion. Some lines passed in front of the arteries; they also had a faint stippled appearance. The disc showed signs of having been edematous. Similar appearance he has seen in retinitis pigmentosa also in a case of contusion of the macula.

Extensive pigment changes in the retina were observed by **Krauss** in a boy whose left eye was struck by a BB shot. The retinal changes were very marked in the pigment layer, resulting in many pin-head opacities scattered through the lower half of the eyeball, with a large mass at the temporal side.

A rare fundus condition is described by **Junius** in a man, aged 30, who had developed facial erysipelas during which both eyes had been swollen. In the right eye the disc was almost white, the arteries were thin, some with fine whitish borders. On the temporal side of the disc the retina was irregularly condensed in the form of stripes or sail like, more reflecting. The impression was gained that minute hemorrhages were lying there. This condensed portion comprised also the macula and showed there a number of fine-grouped larger and smaller bright and reflecting round foci; from here a number of hair-like short and longer bright lines radiated to the temple. Almost no vision; L. E. phthisis bulbi. The conclusion is that the erysipelas led to a meningitis and metastatic abscess of the left eye, and inflammation of the optic nerve and retina in the right eye resulting in complete atrophy of the optic nerve and changes in macula. In the retina strong exudation must have taken place.

One month after the last exposure to the hard x-ray tube for a carcinoma of the right inner canthus, the patient of **Ehnhuus**, a man, aged 67, noticed his vision poor and his eye was markedly injected. The disc was blurred; yellowish-white plaques about ¼ d. d. were seen in the retina above and below the disc, and flaming reddish-yellow appearance with diffuse pigmentation above and toward the temple. Three months later the injection had disappeared, the plaques were atrophic and vision was again normal.

Familial Macular Degeneration.—As belonging in this class, **Blue** considers the changes found in a girl, aged 18, and her father, aged 43. The girl's vision began failing when 12 or 13 years old, and was finally 6/60. In each macula was a lesion which is not further described. The father had good sight until eight years before; R. E., 6/30; L. E. 6/60; negative central scotoma. Lesion in each macula of moth-eaten appearance. The mother and younger sister of the girl had normal eyes.

A patient, who had been treated in different ways by others, was finally found by **Stargardt** to have familial degeneration of the macula. He was a man, aged 35, whose vision began to fail rapidly at the age of 12. A brother, aged 33, is supposed to have very good vision, but a sister, aged 30, had good vision until 17 years old, when gradual deterioration set in. In each macula of the patient a dirty-greyish-yellow to grey-green focus could be seen. The focus was sharply defined, horizontally oval, 2x1.5 d. d., and its nasal margin was about 1 d. d. from the temporal margin of the disc. On the foci were fine pigment and very fine greyish white dots, which glittered with the movements of the eye. Foveal reflex was absent. Around the foci were numerous small grey-white dots with indistinct edges. Aside from the central scotoma the fields were normal for colors and for white. Color sense and dark adaptation were normal. Stargardt objects to Leber including the familial progressive generation of the macula, together with the honeycomb choroiditis of Doyne, and of Best's hereditary macular affection under the heading of familial tapetoretinal degeneration of the macular and papillary regions, since there are enough marked characteristics of each group to warrant their classification as separate entities.

Amaurotic Idiocy.—The paper by **Neurath** reports a case of familial amaurotic idiocy in a child of 15 months, the third non-related Jewish parents from Galicia. The first normal child died of febrile disease, the second one was mentally defective and died aged 18 months. The case, a typical one, is the first observed in Vienna. See **Roenne** under pathology.

Epstein reports four new typical cases of amaurotic idiocy in children of Jewish non-consanguineous parentage. No etiologic factor, including syphilis and tuberculosis was found. The report also embodies the two cases previously reported (Y. B. 1917, v. p. 114). Mendelian principles may perhaps be underlying the etiology of the disease which may ultimately be found in some abnormal action or reaction in the endocrinic group, influencing metabolism and nerve cells. At present facts do not point in that direction.

The case recorded by **Clarke** was that of a boy aged 15 months, the child of second cousins, Hebrews. He had never been able to sit up and did not seem to notice objects. Light perception was doubtful. The central regions of the retinas were light grey with bright red spots at the macula. The optic discs were not distinctly atrophic. A sister with a defective central nervous system had died at the age of 2½ years.

Coriat has made a study of familial and hereditary features of amaurotic family idiocy based upon twelve families, nearly all of which were seen and examined in person. In none of the families did the first born child or the first few children have amaurotic family idiocy. The disease seems to appear suddenly after a group of otherwise healthy children. He concludes "that the sudden appearance of the disease is in the nature of a recessive mutation, which follows a sequence of normal children. The disease appears, not because of repeated pregnancies in the mother, since the same repeated pregnancies may occur in non-Jewish families where the disease is absent, but because the child is born with an inferior central nervous system. It is this inferior nervous system which undergoes the rapid degeneration which leads to this serious and fatal disease."

Lesions of the Macula. — Among 14,000 patients, 1,336 of which were over 60 years old, **van der Hoeve** found senile changes in the macula in 329 eyes; 6.125 per cent were between 60 and 70 years, 23.04 per cent were between 70 and 80 years, 30 per cent were above 80 years. Lens changes were found rarely in these cases, while macular changes were absent when the lens opacity was marked. Lens and macular changes are therefore, not due to age alone. Lens changes may be due to the effect of the ultra-violet light, by diffuse dispersion, on the secreting ciliary epithelium. But the diffuse dispersion protects the retina and the senile macular changes may be explained through excessive ultra violet light. Yellow-green glasses are recommended. Of course numerous influences exist producing cataracts, such as familial tendency. He has seen macular changes in aphakic eyes. It takes probably more than ten years to produce such changes, and aphakic eyes are protected by glasses since even ordinary glass protects. Eliott's observation of retinal changes with cataracta nigra, and the choroiditis among the Eskimos are alluded to. The functional disturbance is limited to the fovea. The most peripheral changes are perhaps situated more in the inner retinal layers, and could be attributed to stronger absorption in the thicker part. In the discussion, Houwer mentions objections from an anatomic standpoint. At the center the retina, on account of its thickness, will have a protecting influence. Nicolai wonders why some old people have no macular or lens changes, and how family tendency to the affection is to be explained. See also Y. B. 1918 v., p. 153.

Hole of the Macula.—Among the soldiers in Camp Travis, **Middleton** found twenty-three with changes which he classes as hole in the macula. All gave a history of traumatism at a more or less remote date. The typical picture of hole at the macula was present in some of them, in others the picture differed markedly from the classical description. The hole was much nearer to the disc than the macula in some; detachment of the retina complicated the condition in others. Rupture of the choroid was present seven times. A large exudate in front of the retina and disc was seen once. All patients had wider pupil on the affected side, and the reactions were diminished. The right eye was affected fourteen times, the left one nine times.

From Camp Sherman, **Maxey** reports three cases with hole at the macula, which in one instance was complicated by a flat detachment below and to the nasal side of the disc, of a pinkish color, giving the impression as if there were something underlying it. Commenting on the many cases of hole in the macula in the papers of Middleton and Maxey, **Jackson** speaks of the varieties of hole formation and mentions some of the literature of the affection.

The left eye of **Finnoff's** patient, a man of 24, had been struck by a base ball some months before. The temporal side of the disc was slightly atrophic; in the center of the macula was a deep pigmented hole; ½ d. d. to the temporal side of the macula was a vertical rupture 4 d. d. long. In the bottom of the rupture the large choroidal vessels were still visible, proving that the rupture was incomplete, and that it had not extended as far as this layer.

The patient of **Charles,** with hole in the macula of the right eye, had vision 23/75. In the discussion Post questioned whether it was a true hole because of the good vision. Woodruff recalled a patient with hole and very good vision, and Luedde emphasized that changes near the macula may not be due to traumatism, relating a case in which a large retino-choroidal scar and positive Wassermann justified rejection of the claim for damages because of traumatism. See also **Purtscher** under Detachment.

Bilateral Macular Changes.—A patient with bilateral changes in the macula seen by **Parsons,** had practically normal vision when his mixed astigmatism was corrected. The changes were thought caused by colloid bodies in the choroid. In the discussion, Collins thought the white patches around the disc probably circinate retinitis, i. e., hemorrhages in the retina undergoing organization. Holmes Spicer agreed with Parsons. **Batten's** patient had symmetrical disease of both maculas, which developed after acute papillitis three years before; discs were white. The condition in similar cases occurred about puberty. The patient had no menses for a year.

Rupture in the Macula.—**Fleck** reports the case of a soldier who, among other lesions the result of a shell injury, showed a rupture of the left macula exposing the underlying choroid. **Ricchi** reports that in two of his six cases the injury of the macula was not accompanied by other lesions. (See Y. B. 1918 v., p. 277.)

The macular changes of war wounds of the eyes have been the subject of a paper by **von Szily.**

Adaptation.—Vision in the dark has heretofore been of theoretical and diagnostic interest mainly, **Cobb** declares; it assumed a practical value when night flying was introduced. The individually varying increase in sensitiveness to light of the dark adapted eye has been investigated before he undertook to study, on fifteen individuals, the mode and rate of recovery after blinding by light. The absolute threshold was found to vary between 1 and 10 millionths candle per square meter, with the different individuals. The rate of recovery after exposure to light is also variable, as between individuals; but not corresponding to the value of the absolute threshold. Recovery to the point of visibility of a stimulus 4.7 times the individual's threshold is lower, the lower the threshold. The time of recovery to see a standard test object depends on the individual's absolute threshold and his rate of recovery to see a stimulus 4.7 times his absolute threshold. After short exposures to light the times of recovery are less diverse. Halts in the increase of sensitiveness, in the course of the dark adaptation, suggest the independent working of two physiologic mechanisms. For practical use these data will have to be correlated with the photometric conditions under which the eyes are to be used.

In a critical study of the question of the light sense, **Lohmann** finds that the difference between stimulus and sensation has frequently been overlooked. Physical, physiologic and psychic observations have not been separated. For lowering of the light intensity during examinations, milk glasses ought to be avoided and be replaced by increased distance from the light or by diaphragms. Piper's curves of adaptation represent only the increase of sensitiveness of the retina, they are curves of stimulability. The curves of Hess, which show the increase geometrically and not by addition, are curves of sensitiveness. For practical purposes he recommends, with Hess, that in the examination of adaptation, the adaptation of the examined be compared with that of the examiner.

Commenting on a paper by **Martin** on the Performance of Night Glasses, the **Lancet** discusses the light sense, and explains the different conditions underlying the construction of instruments such as telescopes which we are to see bright but very small objects, and of night glasses that are to be used for dark but rather large objects. In the first instance the instrument is to produce no magnification (of the star), but is to collect all the light possible and thus increase the brightness; in the second instance magnification (even with some loss of brightness) is expected.

Adaptometers.—The apparatus to measure dark adaptation for white and colored lights, devised by **Meyer,** consists of a wooden box blackened inside, 158x19x33.5 cm. Inside of this box, hanging on a cord, slides a smaller one from the bottom of which a broad ribbon hangs down and which divides the larger box into two light-tight compartments. In the little box two plain mirrors inclined 45 degrees to one another are fixed. A 5 or 25 candle metal filament lamp is placed at the bottom of the larger box. Above the globe are three smoked glasses, whose light absorption has been calibrated, and a metal diaphram. At the bottom of the box is also a mirror inclined 45 degrees. Light from the globe strikes the two mirrors in the small box, is then reflected onto the mirror in the bottom of the box and from here reflected to a milk glass which is the object of observation. In front of the milk glass blue, red, yellow and green filters of 3 mm. thickness can be placed. By varying the distance of the small box from the mirror in the lower end of the box, and using no smoked glasses or one or more with the addition of the metal diaphram, and also the use of the 5 or 25 candle power globe, different light intensities can be had from 0.0040817 meter candles corresponding to a retinal sensitiveness of 25 to 0.00000064 meter candle corresponding to a retinal sensitiveness of 156000.

Stargardt's simple and easily made adaptometer consists of a box 107x25x 25 cm. which is divided into three parts by two small partitions. In the farthest end a cylindrical 100 candle power globe is placed; at the opposite end is a glass plate which is to be observed during examination. Into each partition a square milk glass plate of 10 cm. side length is fixed; in front of each a sliding screen can cover any desired amount of the glass plate. The back screen has in its center a quadratic opening of 4.47 mm. side length. By the various combinations of screens, and by removing the front wall of the box, sensitiveness varying between very wide limits can be measured 1/15 to 1/65000.

In order to test the constancy of the radio-active luminous preparations which have been used so much for different adaptometers **Stargardt** undertook experiments and found that a sample kept for eight months in the dark showed no change in brightness. Exposure to daylight of even a few seconds increases the luminosity as high as 100 times; the upper limit seems to be about 200 times of the original value. This increased luminosity is only temporary, and disappears after a longer or shorter interval to make room for the original intensity. For practical purposes it is good to keep the test object in absolute darkness for three to six hours before examination is begun.

Best's adaptometer, alluded to in Y. B. 1918, v. 15, p. 156, has a 5x8 cm. surface covered with luminous paint; through screens and umbral glasses the light intensity of this surface can be diminished in such manner that each intensity is one-half of the previous one. The luminous plate is placed into a box which has a frosted glass of 6x8 cm. as the object of observation. Bringing the luminous plate nearer or farther the frosted glass introduces another variability of the light intensity.

The adaptometer of **Comberg** consists of a long wooden box in which the distance of a surface covered with luminous paint from a milk glass, the object of observation, can be varied in a range from 0 to 30cm. In front of the milk glass is a smoked glass of 75 per cent absorption. In daylight the apparatus can be used with a hood-like light tight attachment.

Wiedersheim improvised an adaptometer out of a stovepipe blackened inside and outside; the pipe was 1 meter long, its diameter 10cm.; at one end was placed a cover containing a transparent ring of 5cm. and 4 mm. thickness which served as the test object. The light of a pocket battery, diffused through paper, could be introduced through the open end of the pipe, and its distance from the test object varied. The statements of the examined were checked by the normal individual. For another reference to this instrument and other adaptometers see page 7.

The five-point adaptometer of **Birch-Hirschfeld** is described in his paper on hemeralopia Y. B. 1918 v., p. 158.

Eperon's phototometer, utilizing a candle as the source of light, is built after the principles of Nagel-Piper. It allows variation of light intensities from 1 to 8000 and the sensitiveness of the macula can be measured with a Landolt ring adapted for 25 cm., the illumination of which can be varied. **Cramer** advises the use of the Landolt ring in determining dark adaptation.

Hemeralopia — That the fundus changes described by him (Y. B. 1916 v., p. 115) are characteristic of hemeralopia, **Augstein** finds confirmed by observation of 63 new cases. In 28 cases he found the white gray fundus of his first group, and discovered that a ring scotoma existed in these cases. The white grey color is produced by the discoloration of the pigment epithelium. From examinations of school children, in which he found a moderate grey white fundus in 4 per cent of the boys and 2 per cent of the girls, Augstein concludes that the pigment increases during life, and that a retardation of this development would reveal a hereditary amblyopia with ring scotoma and grey-white fundus, as a first step towards retinitis pigmentosa without pigment.

Belonging in his second group were 16 cases; among them were one with ring scotoma and one with severe acute dazzling-hemeralopia. For this group inflammatory causes are absent, but repeated exposures to strong light are blamed. Eighteen cases belonged in his third group, among them were a number of myopes of over 6 d. In addition, he reports an acute epidemic of dazzling hemeralopia among 100 Russian Mohammedan prisoners, 31 of whom took sick. Of these, 21 had a grey white fundus, 7 a depigmented periphery, none showed the fundus of his second group and 2 had negative fundus. No malnutrition was present. Dark glasses and stay in the dark room brought about considerable improvement. Of the unaffected Mohammedans, 11 also showed hemeralopic fundus changes; of these, 9 subsequently developed hemeralopia. Congenital hemeralopia is the subject of a paper by **Nakamura**.

With his own and Nagel's adaptometer, and the use of red and blue filters, **Wessely** investigated disturbance of adaptation checking the results with the normal. Of 120 men not wearing glasses, 80 per cent showed normal adaptation, 15 per cent had the adaptation diminished one-half, 3 per cent even lower. The higher refraction anomalies make conditions less favorable, 10 per cent show a reduction of 1-3 to 1-6, mainly myopes. These disturbances Wessely calls physiologic inferiority. Characteristic for them is that the difference from the normal appears only late after entering the dark room. Two types exist; in the one the inferiority appears in the middle part of the adaption curve, while the end of the curve approaches more the normal; in the other group the difference remains the same to the end. In these cases the Purkinje phenomenon is normal, the opposite of that which is found in true hemeralopia. They are cases of raised liminal values. These patients discover their defect only under war conditions. **Krebs** has written on night blindness in war.

In Mesopotamia **McPherson** found 23 cases of night blindness among the British and 393 among the Indian troops. A few were due to retinitis pigmentosa, the bulk had no retinal lesions. Almost half the cases had xerosis of the conjunctiva bulbi, but many cases with xerosis had no night blindness. Of the remaining cases, with no objective symptoms, some were debilitated, a fair number were apparently healthy. With illiterates taking of the field is almost impossible. Those suspected of simulation were quickly cured when put on extra day duty. Treatment consisted of codliver oil and bandaging both eyes during the day. Glare glasses are advisable.

Dor reports a new case of traumatic hemeralopia in an officer, aged 25, who fell on his head and remained unconscious for 23 days, and who showed complete amnesia of what had occurred during this time. Repeated lumbar punctures had been done. Four months after the accident he returned to duty and found for the first time that he could not see at night. Fundi and vision were normal, the fields were contracted for yellow and blue. Ten months after the accident the condition still persisted. The prognosis is poor.

Roelofs and Zeeman have calculated the luminosity of objects during a cloudless March or April night to be 0.0003 meter candles. After long dark adaptation this is sufficient to recognize objects. It reduces vision to 1-4 and less. With errors of refraction a much greater illumination is necessary, and such patients will have difficulty in seeing in twilight. Similarly people with small pupils and cloudy media. Psychic factors and poisonings influence the development of hemeralopia.

Among healthy soldiers **Ashikaga** repeatedly found hemeralopia after exposure to strong sunlight. Examination usually showed increased retinal reflexes, enlarged dark vessels and the fundus somewhat grey, while the disc was surrounded by a dark halo. All this seemed to disappear after light tight occlusion of the eyes. Ashikaga thinks that in idiopathic hemeralopia the pigment epithelial cells are congenitally weak, and that their function and the production of the visual purple are not sufficient under exposure to strong light. In Oguchi's disease the pigment cells are even more weakly constituted, and their function is not sufficient even in ordinary daylight.

Okamura reports a case of congenital hemeralopia with negative fundus. In four generations of the patient's family five members were thus affected.

Relating four examples, **Bussy** proposes a new subdivision of hemeralopia—pseudo-hemeralopia. 1. A man, aged 42 years, complained of difficulty of seeing at night for three weeks. Right pupil small, left one wide, Argyll-Robertson pupil, no Romberg, no ataxia. In the dark the sight was good with the left eye; with the right eye everything appeared dark red, and feebly illuminated objects could not be noticed. In the dark marked difficulty existed in judging distances and in walking up to objects because of the patient being like a one-eyed one. 2. Patient with disseminated choroiditis in the lower temporo-posterior part of the right eye. Field was normal for white and red, contracted for blue. Left eye normal. In the dark the patient behaved like the first one. 3. Artillerist, right eye, 1 D, vision 1, and left eye, 6 D, vision ½. Fundi and media were normal. In the dark normal vision of the right eye, poor vision of the left eye, and patient behaved as the above. 4. A man with posterior synechia in the right eye sees well during the day and has difficulty at night.

These patients act during the night like one-eyed individuals. The first and fourth cases do not get sufficient light in the dark because of failure of the pupil to dilate. In the second and third patients the night-blindness is due to diseases of the choroid, the photographic plate is of poor quality, so to speak. These patients see in the dark with their good eye only, and cannot judge distances because of the failure of the other eye. Because their unilateral blindness is only intermittent, during the night, they cannot improve their stereoscopic vision as other one-eyed people do. Among 76 cases of hemeralopia during the war, he found seven cases belonging to this group of spurious hemeralopes in consequence of unilateral blindness and loss of binocular vision in the dark.

Aubaret distinguishes four classes of hemeralopia. 1. Symptomatic or pseudo-hemeralopia. Here objective lesions such as corneal maculae and pigmentary changes in the fundus, or errors of refraction such as myopia are found. 2. Hemeralopia because of insufficient pupillary dilation in the dark. 3. Insufficient retinal adaptation. Pigmentary degeneration and syphilitic retinitis are well known for their hemeralopia. Trench hemeralopia is a manifestation of poor nutrition and nervous and psychic tension; it passes off in a few days under improved conditions. 4. Hemeralopia from insufficient central adaptation and from simulation. It is found in physically and morally exhausted predisposed individuals. It is tenacious in character; a few days generally suffice for a diagnosis. Examination is to be done under various conditions of light, the distance from the test types is to be varied; smoked glasses of different shades have given great help. As to treatment, he recommends correction of refractive errors, relieving the miosis by atropin, smoked glasses for defective retinal adaptation, tonics, diet, codliver oil and arsenic.

Rauch gives the following forms of hemeralopia: 1. Simple, transitory hemeralopia; of short duration and good prognosis; it is produced by very strong light and has been found frequently during the war. 2. Neurogenous night-blindness accompanies severe nervous affections following physical and psychic disturbance. 3. Hemeralopia from diminished activity of the adaptation; it is in part possibly of hereditary nature. 4. Hemeralopia following general trophic disturbance; it was rarely caused by under-feeding during the war. Codliver oil is of no special value, but Euphos glasses might be recommended.

While a war prisoner in Siberia, **Hueft** repeatedly noticed that scurvy and hemeralopia appeared almost at the same time, and that this occurred mostly in the spring, and not during the winter, which is the time of the most difficult conditions in the barracks. Most scurvy patients experienced sooner or later a period of hemeralopia. The hemeralopia was each time cured in a very short time, regardless whether it had existed a few days only or for months, by the simple use of liver or codliver oil. This would prove an alimentary cause, and Hueft thinks this treatment should always be tried before a case is classified.

Among 70 patients with scurvy, **Blatt** found 12 with ocular symptoms. Of these, 3 had retinitic disturbances, 2 had field alterations and all 12 showed hemeralopia; 5 had subconjunctival and 3 lid hemorrhages, 2 had superficial keratitis.

Jess observed hemeralopia as a result of gassing in four soldiers. Three of these had normal sight before, and discovered their defect soon after the gassing. The fourth patient complained of it only six months later, although he had noticed diminished sight ten days after the gassing. The fourth patient only had lowered vision during the day as a result of neuro-retinitis; the others had normal vision. The fields of all were contracted for colors especially; adaptation was diminished. Vascular disturbance in the choriocapillaris and retina, together with edema of the retina, are assumed as the cause of the trouble, which seems to be capable of retrogression.

Rauch has observed thirteen cases of night blindness very carefully and believes in exact field examination under ordinary and reduced illumination. The examination is to be repeated at different distances from the fixation point and on different days, in order to verify the statements. All his cases were transitory, and in one the affection had a periodic character. It is not due to malnutrition, because improvement occurred with the same conditions continuing. It is caused, he believes, by increased metabolism in the retina and choroid, by the increased light effect of snow, etc., and by the insufficient regeneration of the visual purple because of short and disturbed night rest. Hemeralopia is thus an essential eye condition.

For the diagnosis of night blindness exact field examination is essential, **Wolffberg** insists. Contraction of the field below produces hemeralopic disturbance. In thirty cases of hemeralopia with negative fundus, and normal light sense, with the Foerster photometer, the least contraction of the lower field was at 45 degrees. The color field is important; contraction of the blue field is typical for hemeralopia. Hemeralopes with positive fundus findings are unfit for military duty; those with idiopathic hemeralopia, or caused by disturbed nutrition or neurasthenia, are unfit for service until cured. Those showing only contraction of field below are to be relieved of night duty. Hemeralopia may be feigned, but also concealed. To unmask these individuals he recommends examination with the use of his two radio-luminous rods and his color diagnostic apparatus.

Among tabetics in the early stages, **Lafon** observed a kind of pseudo-hemeralopia. These soldiers were unable to march at night, but their difficulties could not be explained by the miosis or the contraction of the fields. Defects in the adaptation when at all found in these cases were not sufficient to explain the trouble. Lafon explains these complaints as due to a disturbance of the sense of equilibrium which became manifest when darkness prevented the helping guidance of the eyesight.

Hemeralopia is an etymological nonsense and even a contradiction, **Terson** says, and proposes the term "hesperanopia" for it; amblyopia in the twilight. An editorial of the British Journal of Ophthalmology approves of Terson's new term for night blindness, and says its use ought to be encouraged.

Congenital Cone Blindness, Nyctalopia.—An unusual case is reported by **Eason** in a totally colorblind woman, aged 34, with negative family history. She is almost completely blind in the sunlight and begins to see better when the sun goes down. Her vision is best in bright moonlight. She reads comfortably in artificial light or moonlight. In ordinary daylight she cannot even see the test card across the room. With her hyperopic correction she reads Jaeger 2 or 3. She can walk from the street into a cinema hall and can at once see the numbers on the seat. The eyes show fine vertical nystagmus, normal fundi, no albinism, rather red discs and small vessels. It is assumed that owing to some developmental defect, or a reversion to type of the nocturnal animal, the retinal cones have not been developed. On the basis of von Kries' theory the case is to be looked upon as one of congenital cone blindness.

Detachment of Retinal Vein, Traumatic.—An isolated tearing loose and floating in the vitreous of a retinal vein without a tear or detachment of the adjacent retina was found by **Lacroix** in a soldier who was struck by a piece of wood and received a wound of the upper lid at the inner canthus of the left eye. The pupil was of the same size as the other, but reacted sluggishly. At first vitreous dust prevented fundus examination, but this cleared after two weeks. A big clot was found attached in the region of the bifurcation of the inferior vein, floatingly freely in the vitreous. A chorioretinal tear was present in the macula. Above the disc a long and fine tear in the retina began and extended forward to the ora serrata. Following the inferior temporal vein it was suddenly seen to leave the level of the retina and to project into the interior of the eye. The vein was free and isolated, and seemed attached at the peripheral end because it retained its normal direction. It was full, its walls appeared normal and of the normal color; there was no change of the central reflex, no tear, and the circulation did not seem to be interrupted in it. The corresponding part of the retina was not at all detached and showed no break in the continuity, but appeared paler than the rest of the fundus. Vision 1/50. The pallor of the retina corresponding to the detached vein is possibly due to the interference with the circulation by the detached vein.

Detachment in Albuminuria.—In a British soldier with trench nephritis and rheumatism, whose sight began to fail and who had edema of the conjunctiva, **Derby** found marked swelling of the disc, hemorrhages and areas of pigmentation, together with whitish areas of degeneration. In each eye marked detachment was present below, reaching up to the disc and the macula. General condition and vision improved, and detachment disappeared in each eye, while the fields became almost normal.

Detachment Following Cataract Extraction.—Detachment of the retina following cataract extraction was observed by **Roberts** in a man, aged 46, in whose family early cataract was noticed in two or three generations. The left eye became dim at the age of 25, and the lens was extracted at the age of 40. The capsule being opaque and tough, it was removed with capsule forceps immediately after the extraction. Vision was good until recently, when detachment set in below and to the nasal side. In the interval the right lens had been removed with no detachment following.

Detachment in Nephritis and Toxemia of Pregnancy.—Three instances of detachment of the retina during pregnancy in primaparae are reported by Schiotz, their ages being 17, 29 and 35 years. All had albuminuria and eclampsia, and the detachment occurred after several convulsions. It was bilateral in the oldest patient and persisted for a month after the miscarriage, with final vision of 1/6 and 1. In her case albuminuria returned at the next pregnancy five years later, but disappeared after abortion and did not affect vision. In the second patient retinitis and detachment lasted two weeks, and the detachment disappeared two days after delivery. The youngest patient developed eclampsia after delivery at the normal term, and the detachment appeared with papillitis only and no retinitis. No change in the condition occurred during the year of observation. A fourth instance of detachment occurred during the fourth pregnancy of a myope. The eye became blind, and in the other eye detachment occurred before the end of the next pregnancy. No albumen, no sugar. A Mueller scleral excision just before delivery brought about reattachment within a week in the one eye, but vision declined a few months later. Only four other instances of detachment during pregnancy in patients without albumen are on record. Of the five patients, three were strongly myopic. Schiotz concludes that the longer the interval between the onset of the detachment and the delivery the smaller the chances of restoration. It is therefore extremely important to interrupt the pregnancy early.

Though examining all patients with albuminuria in the Maryland Lying-in Hospital for fourteen years, **Clapp** saw no detachment until December, 1917. Since then six cases came under observation. Detailed histories and fundus drawings are given. The ages of the patients were 25, 31, 38, 36, 40 and 33. The detachment occurred mostly at term, but also in the sixth and eighth months of pregnancy. All but one had bilateral detachment. In all the detachment disappeared soon after delivery or interrupted pregnancy leaving normal fields. Patches of exudation, hemorrhages, edema of the retina, pigmentation, vitreous opacities and optic neuritis accompanied the detachment. It was mostly below and once all around in both eyes; in one eye it was in the temporal periphery, and it looked like a wrinkle in three eyes. All patients had albumen and casts; nephritis is mentioned twice, and was probable in a third case; eclampsia and convulsions are mentioned three times.

Stoewer's patient, a woman of 24, suddenly complained of disturbed vision in the sixth month of her first pregnancy. On the right side paralysis of the externus and large tense detachment of the retina below and to the nasal side with small hemorrhages in the macula were found. In the left eye was seen weakness of the externus, extensive and pale chemosis of the conjunctiva bulbi, and a large detachment above, with small hemorrhages in the macula. Considerable albumen. Soon after abortion was performed the chemosis disappeared, albumen diminished and detachment in each eye was gone, leaving fine white lines. Later the paralysis of the recti disappeared, and the hemorrhages became absorbed. In the macula black and grey spots appeared and finally the discs became somewhat pale with improved vision and normal fields. In albuminuria retinal detachment is more frequent than eye muscle paralysis, but in the cases in the literature pregnancy nephritis was not the cause of the paralysis. A hemorrhage in the nucleus of the right abducens with edematous compression of the left one is assumed for his case.

Anatomic Conditions in Detachment.—Alluding to his discussion of the anatomic causes of detachment (see under Pathology), **Gonin** now speaks of the necessity of diagnosing the mechanism of each case of detachment for its proper treatment. But in practice only the detachment by pulling up, attractio retinae, the idiopathic detachments need be considered, since in those of other mechanisms other symptoms and indications aside from the detachment dominate the clinical picture. In idiopathic detachment some changes in the uvea and vitreous always precede the detachment.

In order to be successful, treatment must consider that detachment is the result of traction by the shrinking vitreous, that the subretinal fluid communicates with the vitreous through tears in the retina, that the detachment begins above and tends to sink down, and that reattachment is only permanent when the tears are closed and traction of the vitreous is minimized by adhesion between retina and choroid. That is why simple evacuation of the subretinal fluid, bandage, rest in bed, cauterization and subconjunctival injections are of such doubtful value. Deutschmann's operation is logical, but, to be effective, is technically difficult.

In the discussion, Siegrist suggests placing the patient on a higher seat to facilitate the search for the tear where it is generally found, in the upper temporal periphery. He finds Gonin's theory of preexisting and predisposing choroiditic adhesions in contradiction to that of Leber, who assumes primary peripheral degeneration of the retina, accompanied by proliferation of cells, mostly pigment cells, which in a flat layer cover the inner surface of the retina, and by their shrinking lead to tears and detachment. Only 5 per cent are permanently cured. Bandage favors absorption of the subretinal fluid, according to Wessely. Siegrist introduces through the sclera a needle connected with the positive electrolytic pole, passes 3 ma. current for two or three minutes, and then trephines the sclera. One case he cured this way, another one by scleral puncture with the knife, followed by cauterization and 10 per cent salt injections in the neighborhood, and a third, already lasting one year, by dorsal decubitus, bandage and 4 per cent saline subconjunctival injections.

Traumatic detachment of the retina with glaucoma was found in **Bergmeister's** patient, a girl of 13, whose left eye had been injured at the age of 6. On the nasal margin of the excavated disc began a steep extensive detachment extending downward and to the temple into the extreme periphery. It did not fluctuate; it showed grey-white folds, while the retina was mostly transparent; the periphery was greenish-grey. Through the transparent retina an extensive network of typical yellowish-white striae was seen; they radiated from the disc and were connected by cross lines. According to Mueglich, the striae are the result of fibrin coagula. This might possibly indicate that the subretinal fluid in this case was very rich in albumen, Bergmeister thinks. The glaucoma, too, in view of the comparative elasticity of the sclera, owing to the age, might be due to the greater albumen content of the eye fluids (Uribe Troncoso's theory of glaucoma).

Detachment, peripheral tear and hole in the macula in the right eye of a man, aged 38, was demonstrated by **Purtscher.** The vitreous contained large floating opacities. The detachment was reddish-grey opaque and extended over the whole fundus, excepting only the nasal quadrant. In the macula was a 1/3 d. d. dark red, sharply defined area, a hole. Through it the bare choroid covered only with minute black, and a few white spots could be seen with a strong minus glass. Around the hole the detached retina was uniformly grey, opaque and showed fine radial folds. In the extreme upper periphery was a 3 d. d. long tear of the retina, of horseshoe form with its convexity toward the center. Through the tear the atrophic choroid was visible. The left eye showed choroidal depigmentation above the macula and several choroiditic foci in the periphery. The whole formation was thought to be spontaneous and to have occurred in the detached retina. But owing to the conditions found in the other eye inflammatory thinning of the retina at this point, predisposing to the hole formation could not be excluded. In the discussion Fuchs thought that the portion of the retina corresponding to the hole had been adherent to the choroid and was torn out during the detachment.

Potts showed a patient with detached retina, thickened and swollen bulbar conjunctiva and edematous sclera of fatty appearance. In the discussion, Thompson thought the signs pointed to a new growth of tubercular origin, and Holmes Spicer said it reminded him of the appearance in some syphilitic cases.

In a case of retinal detachment following an explosion of acetylene gas, **Barrett** and **Mitchell** observed that there were large areas of retinal detachment and choroidal rupture. Light perception was lost.

Treatment of Detachment.—Seible reports on 163 cases of detachment of the retina. In twenty-three cases the detachment was bilateral. Ninety-two patients had myopia, which was higher than 7 D. in 61. In 64 patients myopia was the sole cause, in 20 an injury, in 15 an irido-choroiditis, in 2 proliferating retinitis, and in 1 congenital dislocation of the lens were additional contributary causes. In 61 cases no cause could be found. Of 186 affected, eye cure was established in 12 only; 7.9 per cent were improved. Of 48 cases examined after some time, 8 showed secondary glaucoma. Of the 12 cured cases, 11 had received conservative or no treatment, 1 had been operated after Deutschmann.

Moderate detachment below in **Marques'** patient, aged 40 years, was cured after three injections of 25 per cent sodium chloride and the compression bandage. A relapse after two months was again cured after ten days, and the cure was still lasting five years later. **Janney's** patient, a man, aged 20 years, had bilateral detachment of the retina with negative findings. **Hanssen.** See under Pathology, p. 161.

Reviewing his experiments and 142 cases with spontaneous detachment, **Birch-Hirschfeld** says rest and subconjunctival injections may bring about a reattachment when cases are seen early. When no improvement results, operation is to be done if the detachment is below, if the media are clear enough to allow supervision of the operation, if the pressure is not too low and no tear exists in the region of the proposed operation. The function of the still adherent retina must be good. With a trephine of 1.5 to 2 mm. the sclera is opened and the subretinal fluid aspirated; retina having returned into position, compression bandage is applied. Reattachment occurred in five of twenty-five patients, improvement in five, and the others showed no change. Better results were obtained when the aspirated subretinal fluid was diluted with saline and reinjected into the vitreous, in greater quantity than aspirated. This was done in thirteen cases; in six of these inflammation resulted in the interior, and five of them were improved. Because of the inflammation which accompanies this procedure, he now only trephines, aspirates and applies the bandage. Spontaneous cure occurs in 1 per cent of the cases.

Since 1914 **Ohm** performed trephining of the sclera according to Schreiber for detachment of the retina. In his seven cases, two showed perfect restoration of function and reattachment; in one of these cases the restoration of function persisted during two and a half years; one case showed favorable result, one was markedly improved at first, but deteriorated later, but was finally stationary; three were worse. Trephining ought to be, on account of its harmlessness, among the first things to be tried. Fresh, flat and partial detachments form the indication. The operation prevents wounding of the retina and gives the advantage of allowing more thorough emptying of the subretinal fluids. Good hemostasis on the vessels of the conjunctival flap must be performed. Bleeding may occur in the vitreous and retraction of the conjunctiva may occur even eight days after the operation.

Deutschmann reports on a series of 400 eyes operated for detachment. Seventy-five times the operation was done upon the urgent request of the patients in spite of the poor prospects. Of the remaining 325 eyes, 94 were cured, 147 improved. Fresh detachment, as long as the subretinal fluid has not sunk down, is not to be operated. Patients are permitted to move about, but are warned against excessive physical exertion and imprudence in eating and drinking. This way the subretinal fluid sinks down easier. After this the treatment is always operative. Simple incision is repeated until it is determined that no further improvement can be accomplished. He combines the incisions advantageously with incisions of the retina at the ora serrata, for the purpose of relieving the tension in the retina. If these methods fail, then vitreous injection with sterile vitreous of the calf is performed.

Spontaneous cure of detachment of the retina in the right eye of eight years' standing is reported by **Marin Amat** in a man, aged 40, who lost the sight of the only useful eye, the left one, recently. The left eye showed seclusion of the pupil and was totally blind. The right eye showed greatly diminished tension, total detachment of the retina and light perception in the lower field only. Condition remained unchanged for about three months, when he began to see faces with his right eye, according to his brother's report. Three months later vision was said to be as good as formerly. No form of treatment had been used. Examination several months later verified the marked improvement in vision; detachment was entirely gone, retina appeared normal, there was only slight depigmentation of the choroid on the nasal side, and the white stripes seen after reattachment were absent. After correction of the myopia and astigmatism vision was 2/3. The case is to teach us the lesson that myopic detachment may also be cured spontaneously. Amat says it is advisable to examine all detachments at intervals; the secret of spontaneous cure might thus be found. In bilateral detachment all harmless operations should be tried and the subretinal fluid examined chemically and microscopically.

Taylor's patient, a girl of 12, with a mitral bruit and moderate myopia of the right eye and high myopia of the left, developed detachment of the retina of the left eye, above and to the nasal side. Atropin, bandage, rest in bed and anti-rheumatic treatment, because of pains in her legs, were ordered. Two weeks later the retina was entirely reattached and has remained so these last seven years.

Among **Helming's** patients with detachment the affection was 162 times unilateral, 9 times bilateral; 72 per cent were men, 28 per cent women; 22.8 per cent were between the ages of 50 and 60. Tension was usually normal or diminished; 46.8 per cent had vitreous opacities. The detachment was mostly below. Higher myopia was generally present. In 33 per cent myopia was the sole cause of the detachment. In six of these cases extraction of the lens had been done for the myopia; the detachment developed in four of these cases years afterwards. Diseases of the choroid were considered the cause in twenty-three cases; in twenty-five no etiology was found.

Toxic Amblyopias

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This section of the Digest carries the literature from April, 1919, to June, 1920. For previous reference see A. J. O., September, 1919, p. 161.

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DIGEST OF THE LITERATURE.

Tobacco Amblyopia.—The question is frequently asked the oculist by the layman, "Does smoking injure me, and is it harmful to the eyes?" **Jameson** answers that tobacco must be regarded as a poison if used in any considerable amount; and that the general opinion is that it is always injurious to the young, acting as a poison to immature cells.

To put others on guard when examining a case of toxic amblyopia in a woman, where, in default of anything more definite, a diagnosis of retrobulbar neuritis might be made, **Hine** reports the following case: Mrs. M., aged

51 years, married, consulted him as she could not see anything properly. Fifteen months before, her sight was affected, but after taking medicine from her own doctor, it improved somewhat, but had failed again so she could not see to read. Glasses were of no avail, and when Hine saw her, her vision was reduced to 6/60 in each eye, and there was a very large central scotoma for blue. The fundus showed no changes save slight pallor of the optic discs. She admitted smoking mild cigarettes, but finally admitted that she was very fond of "shag" cigarettes, which her husband made for her when he was smoking a pipe. Prohibition of all smoking soon accomplished a cure.

Alcohol Amblyopia.—**Schulz** discusses the effect on red and green vision resulting from the ingestion of food and drink containing alcohol and caffein. Exhaustive experiments were made on a number of individuals with foods containing these substances with the following results: Alcoholic drinks in even a comparatively small quantity reduce the ability to distinguish between light and dark green, and light and dark red. Red vision is affected more than green.

Caffein had a different effect; it increased the ability to distinguish these colors very materially. Much depends on the method of roasting the coffee.

These experiments demonstrate the dangers resulting from the ingestion of small quantities of alcohol. More particularly in certain occupations, such as railroading, etc., is this true.

Methyl Alcohol Amblyopia.—In an editorial, **Jackson** takes occasion to call attention to the destructive effect of methyl alcohol. While the dangers from this poison are pretty well known by the ophthalmologist, they still need to be urged upon other branches of the medical profession and the public, until some of the measures for the prevention of such blindness, suggested sixteen years ago by Wood and Buller, are more generally put into effect.

In these times of the use of illegitimate liquor, the warning is timely. The writer details the general and local symptoms together with treatment. Particular attention is called to the fact that poisoning may occur through inhalation and topical application as well as ingestion. The chronicity and obscurity of the symptoms in certain of these cases is baffling. Few cases come under treatment soon enough to give good results. The tendency for one who has been on a debauch, is to conceal his folly, therefore the delay. More important than the deaths, are the cases of blindness caused to patients; they are a burden on the community, being life long dependents. Success in treatment depends upon the case being seen early, and immediate eliminative measures being instituted.

In a discussion on wood alcohol and the eyes, **Cutler** states that as long as grain alcohol is not to be obtained, it is of greater importance that its poisonous substitute should be eliminated, in beverages, or extracts, or drugs. Also that its use should be absolutely forbidden even in denatured form, for external applications. Workmen who may be exposed to the fumes of wood alcohol, whether it is used as a solvent or as a means for the production of formaldehyde, anilin colors, celluloid and films, should be protected, as the chronic poisoning which follows the exposure, is more insidious than the dramatic cases of acute poisoning which lead to blindness or death. The ophthalmologist usually sees these patients after the acute stage, the nerves are white with blurred edges; lamina not visible; vessels much contracted; the picture of atrophy secondary to choked disc or papilledema, not of primary optic atrophy. Where the duration of the disease has been short, the history of the intoxication may be obtained and the diagnosis established.

The question of tolerance or of an acquired immunity to the poisoning is exceedingly interesting and has not been sufficiently studied. It is customary to think of the formic acid into which menthanol is transformed in the system, and which is slowly excreted as a cumulative poison; but it is possible that in some instances the chemical transformation may be altered by more rapid oxidization or the tissues may be more resistant. Such acquired tolerance is found with other drugs such as arsenic and opium, and in tobacco and grain alcohol. The following letter from a physician in a neighboring State explains itself. He writes: "We have a formaldehyde plant here, but no cases of wood alcohol poisoning from it that I know of. The purest wood alcohol is used and the natives are used to drinking this as a regular thing. I believe that there is an immunity created, as I know of patients who have taken wood alcohol for years with apparently no effects other than grain alcohol would give. As an example, I have a Norwegian working for me who about once a month will go to a hardware or drug store and get a quart of denatured alcohol which he promptly proceeds to drink, and says he prefers wood alcohol to other whisky, and has taken it for years."

Norris in discussing lesions in wood alcohol poisoning points out that methyl alcohol attacks the most highly differentiated nerve elements of man, which are therefore more rapidly and severely damaged than those of the monkey. Whereas drunkenness in man from grain alcohol is easily recovered from, it is almost uniformly fatal when due to methyl alcohol.

Of seven definite cases of methyl alcohol poisoning received by **Comora** at Gouverneur Hospital during two weeks, two patients recovered their eyesight completely within twenty-four hours. One was able to differentiate colors and tell time on a watch. The fourth while totally blind at first, left the hospital able to see shadows.

Fenton observed a young man who had consumed four ounces of denatured alcohol containing 10% of methyl alcohol. Four days later vision was 2/200. Saline purges, diuretics and acid foods were administered. Instillations of a 5% solution of dionin daily for three days was followed by a return of vision; 20/20 right eye and 20/15 left eye. Two months later vision was still 20/20, pupils dilated and fields slightly contracted.

Birch-Hirschfeld describes in detail four cases of amblyopia among soldiers. Two were cases of methyl alcohol poisoning. The first showed severe gastro-intestinal symptoms, but sight returned to 5/10 for the right eye and 5/50 for the left, with a remaining central scotoma, so that four months after the poisoning he was returned to service. The second case did not recover to more than discerning fingers or hand movements, altho he had not suffered severe gastro-intestinal disturbances. He was one of five, the other four dying within twenty-four hours.

After discussing other cases in the literature the author concludes that sudden blinding accompanied by gastro-intestinal symptoms is a sure indication of methyl alcohol poisoning, but central scotoma and optic neuritis is proof. From his experiments with animals he thinks the first change is a degeneration of the nerve fibers of the optic nerve and ganglion cells of the retina. He could not determine whether the retinal changes were the result of an injury to the nerve stalk, or to a direct action of the poison. By analogy with other forms of scotoma and in opposition to the facts of atoxyl amaurosis, he assumes that methyl alcohol affects the cones sooner and more severely than the rods.

Rightor calls attention to the vital importance of educating certain classes of people to the great danger to the eyesight by the use of wood alcohol as a beverage. The author has had eleven patients whose vision has been so impaired as to render them non-supporting. In pointing out the principal symptoms the author states, that there is no other disease of the eye that causes blindness, whether it be cataract, atrophy of the optic nerve, disease of the retina or choroid, glaucoma or anything else that will produce the same reduction of vision in both eyes simultaneously. **Bab** describes the degenerative changes found in four cases and suggests that this like grain alcohol should be denatured to prevent its use as a beverage.

Zethelius gives here a preliminary communication on the benefit from lumbar puncture as he witnessed it in three cases of blindness from methyl alcohol poisoning. Great improvement followed in vision from the lumbar puncture at once and continued to progress, as the puncture was repeated, in one case, with vision up to 1 in about a month. There had been an interval of four days before any appreciable symptoms had developed, and then all the symptoms except the visual subsided. In the second case the punctures were begun the second day after the ingestion of the liquor, with vision of 1/600 in the right eye and light perception in the left. The amaurosis persisted for twelve days, but by the end of the second month vision had become 3/50 and 0.1. In the third patient, vision increased from amaurosis by the tenth day to 1/180 and 1.5/50 in about seven weeks. In these last two cases there was persisting atrophy of both papillas. The lumbar puncture was repeated three or four times in each case. The benefit from it, Zethelius says, surpassed that from any known method of treatment. We know that alcohol or its derivatives pass into the cerebrospinal fluid; they have been found in it at necropsy in wood alcohol cases, and release of the toxic fluid is thus directly indicated, while reduction of the intra-cranial pressure may lessen to some extent the chance for absorption by the nerve substance of the poison in the fluid.

Fradkine adds to the literature of the subject of alcohol amblyopia from drinking denatured alcohol and eau de cologne, etc., and cites cases of complete blindness, bilateral and monocular, 6 and 2 cases respectively, and many others where some vision was regained, to normal. The author concludes that hygienic measures and education must be instituted in sections of France where needed.

Blegvad discusses central amblyopia from denatured alcohol.

Quinin Amblyopia.—Traquair has done a service to tropical medicine by publishing three cases of quinin amblyopia after comparatively small doses of the drug. In the first, the patient took 2 to 3 grains a day for three weeks, and then was given 20 grains in one dose. Sight was promptly lost, and remained so for a week. Eight months later, the pupils showed tendency to dilatation, the fields were contracted; there was optic atrophy with contraction of the retinal vessels, and the light sense was severely impaired. In the second case, 15 grains of quinin-urea hydrochloride were given every four hours for about thirty-six hours, a total of 120 grains being taken. Total blindness supervened in a few hours; sight began to return in eight days. Three months later, the fields were much contracted, the discs pale, the retinal vessels were constricted, the sight was dim, and the condition was "very unsatisfactory." In the third case, 2 to 5 grains of quinin were given in cachet every four hours for one night. Two or three days later the patient was found to be blind. The total dose of quinin consumed in the twelve hours was estimated to be less than 20 grains. Two months later, the fields were contracted and the discs were pale. A month later still, constriction of the retinal vessels was added to the other ophthalmoscopic signs, the fields were greatly contracted, and the patient had great difficulty in reading. Traquair discusses the various aspects of quinin poisoning; it is, indeed, well that the idiosyncrasy of certain patients should be brought prominently before the notice of tropical practitioners at the present time. The type of malaria which has prevailed in Salonika and elsewhere, has, according to the statement of competent authorities, demanded the exhibition of large doses of quinin. "In a recent work (Malaria and its Treatment, John Bale, Sons and Danielsson, Ld. 1919.) Alport describes how twenty-six cases were treated for seventy-two days with average doses of 35 grains of quinin, the maximum given in any case being 3,560 grains, and the minimum 1,330 grains; he speaks of doses of 60 to 120 grains in 24 hours as being quite safe in ordinary cases."

Desperate diseases are said to require desperate remedies, and it is not for the ophthalmologist to dictate to the physician what doses he may or may not give, but it is our duty to point out, clearly and unsparingly, the dangers of over dosage with quinin. There can be but little doubt that until quite recently the latter side of the question has been overlooked by practitioners.

Elliot, in reviewing the above contribution, states that there is equally little doubt that a comparatively large number of men have been returned to civil life reported to be none the worse for malaria and its treatment, who in reality, have contracted fields, and a deficient light sense, and are very severely handicapped thereby. The records of published cases in the past suggest that some, at least, of these will get worse as time goes on. It will take years before we garner in the full harvest of our knowledge on this subject, and even then it is practically certain that many of the cases will have escaped detection. If with the fullest possible knowledge before them of the advantage of massive doses, on the one hand, and of the risk incurred on the other, practitioners decide to continue such doses, it will be difficult indeed to condemn them, though there will be doubtless much room for the individual difference of opinion. What is important is, the ophthalmologists should follow Traquair's example and publish all cases of quinin amaurosis and amblyopia they meet with and especially those that are encountered in soldiers returned from malarial districts. There is one statement of Traquair's which requires modification, viz., the warning "to discontinue the medicine upon the development of ringing in the ears"; for this unpleasant symptom is probably met with in almost every case where 10 or even 5 grains of quinin are administered to a healthy patient. The rule would be impracticable in a malarial country.

Evans presented two cases of quinin amaurosis which were of peculiar interest, giving almost identical histories of sudden blindness following the exhibition of a proprietary "quinin tonic." The first case was of a man aged 36. He had been drinking heavily for a week, and usually after such attacks took phosphorus and quinin pills, but this time got a half pint of "quinin tonic" and drank it off at once. This was followed by intense headache, and within twelve hours his vision began to fail, and the following morning he was absolutely blind. When examined 80 hours later he had no perception of light in either eye, the pupils were widely dilated and irresponsive to light. Ophthalmoscopic examinations showed general pallor of the optic disc, slightly edematous and hazy; the fovea showed up as a reddish spot against the surrounding edematous retina. The arteries and veins were full, the latter tortuous. Twelve hours later he had some perception of light in the nasal field of the right eye, and the temporal field of the left eye. Three days later he could see to get around his room, and at this time the edema of the retina was disappearing. A month later the discs were found to be pale and veiled and the physiologic cups filled in. Vision in good daylight was 6/6 in each eye, but in reduced illumination he could hardly get about the room. The visual fields were full in good light, but he had a small central scotoma. The vision remains the same three months after the attack, and hearing is still slightly impaired.

The second case was of a man aged 56 years. After a drinking bout lasting ten days, he drank a quart bottle of "quinin tonic" during one day. He also took some phosphorus and some quinin pills. Within twelve hours after taking the "tonic" he had a feeling of heavy weight on the top of his head, and became suddenly and completely blind, remaining so for four or five days, after which he gradually recovered his sight, which, however, has remained foggy near at hand and bad in the dusk. Evans' observations on this case were made one month after the onset of the symptoms. Vision was 6/6+2D. : J.1.+4.50 D. in each eye. The lower half of each field was lost up to 10 degrees of the point of fixation and there was a contraction of 10 to 20 degrees above and in. In the left eye there was a relative scotoma. Both discs were pale and fluffy, and the retinal arteries were thread-like. He had pronounced hemeralopia.

Smith reports the case of a man aged 36 years who was admitted to the General Hospital at Salonika with the diagnosis of pyrexia. A blood film showed the parasite of malignant tertian malaria. On Nov. 5th he contracted clinical dysentery and was given 60 C. C. of anti-dysenteric serum and 45 grains of quinin sulphate by the mouth. As the diarrhea persisted this treatment was abandoned, and on the 7th., 8th., 9th., and 10th., was given 45 grains of quinin daily by the mouth. From the 11th to the 15th by the addition of 20 grains given intramuscularly, the daily dose rose to 65 grains, the diarrhea gradually lessened and the temperature began to settle. He had borne the quinin well and had shown no symptoms of poisoning. On the 15th. after a total dosage of 50 grains for that day, he suddenly vomited and said he felt queer. Four hours later he noticed things were becoming dim, and in another hour he appeared to be blind and deaf. The ocular examination showed R. and L. vision bare perception of light. Pupils 5mm. equal, and react to light. Discs not clearly focused, color normal. Venous engorgement. Veins double the size of arteries. No change in macula. Three hours later the eyes were again examined and there was no change. Two hours later, hand movements. Eleven hours later, distant vision=4/6. Eleven days later R. and L. 6/6 reads J.1. The author also saw 13 other cases of quinin amaurosis, which he hopes later to publish, giving in detail the ophthalmoscopic findings seen. The treatment he also expects to take up at a later date.

Jamieson and Lindsay studied the effect of quinine on the visual apparatus in cases of chronic malaria that had been under treatment with considerable doses over a long period. The condition of the optic nerve was judged from the visual fields. Those who had ten grains of quinine daily showed full fields; those with fifteen to thirty grains daily showed medium contraction of the fields; those with thirty or over and long continued showed small fields. The preparations of quinine used were the sulphate and hydrochlorid, quinidine and euquinine; also quinin alkaloid. Five men who had no malaria and with normal visual fields were given large doses of quinine as follows: Three men were given ninety grains of the hydrochlorid daily, for three successive days. There were no changes in the fields. One man was given an intramuscular injection of bihydrochlorid, fifteen grains for fifteen days, with no effect on fields or nerves. One man was given thirty grains of the sulphate daily for a month with no effect. Neither the number of malarial parasites present nor the anemia bore relation to the visual fields.

Long continued treatment with quinine contracts the fields of vision in some cases, as 22% showed medium fields, and 13% small fields; 45% showed increase of the contracted fields on a continuance of treatment with quinin; 8% showed a decrease. In none of the cases could changes be detected in the discs or retina. It would seem there need be no fear of effect on the visual apparatus in giving doses of thirty to forty-five grains daily of the preparations used. When the visual field is contracted no fear need be felt as it will expand again. **Agostino** in his graduation thesis reviews the general literature of quinin amaurosis.

Three cases are reported by **Kirkpatrick.** One was of a man of thirty who treated himself to large doses of quinin for 8 months until he could only tell the difference between light and dark. Both nerves were dead white with sharp edges, but no cupping. The retinal arteries were markedly thickened. A woman of 23 was given a quinin injection for malaria. Her sight failed 10 minutes afterwards. After three months vision was reduced to hand movements the pupils dilated, but reacting to light. All branches of the retinal arteries were small and much thickened. The nerves atrophic and slightly cupped. A man of 35 swallowed quinin by mistake for epsom salts. He became blind, and unconscious for 24 hours. Vision returned and improved for a year until it reached 6/10 in each eye with a contracted field. The retinal vessels were small and thickened. (See p. 214).

Ethylhydrocuprein Amblyopia. — Ujiie, of the Institute of Pathological Anatomy of Basel, in discussing the pathological anatomy of ethylhydrocuprein-amaurosis, reports the following case history: A girl aged ten years, was taken with a purulent pneumococcus peritonitis with lung complications. She received six times, at intervals of four hours 0.2 g. of ethylhydrocuprein. After two days, total amaurosis took place. With the ophthalmoscope the blood vessels appeared somewhat narrowed, the discs were brought out sharply, and the remaining back part of the eye was edematous. Death took place six days after blinding. The microscopic examination of the back portion of the eye-ball showed extended injuries to the retina and especially the optic nerve, which consisted of edema, vacuole formation in the retina, and marked degeneration of the nerve fibers of the retina and optic nerve. After these reported changes, one can not easily conceive that in one case a complete recovery, and in another case a continuous destruction, can result.

For a supplement to this report, the reader is referred to the second publication by **Uhthoff,** who reports on the post mortem examination after the use of ethylhydrocuprein followed by blindness. The case is interesting having been one of old retrobulbur neuritis due to chronic alcoholism. The blindness had been total for two hours, but the day following, the vision had improved slightly, leaving narrowed fields and a central scotoma. The optic discs were congested. Death was due to alcoholism and peritonitis, attended with great agony, fever, and general infection. The papillo-macular region was in a state of degeneration, complete destruction of the nerve fibers attributed to the ethylhydrocuprein. The ethylhydrocuprein had been administered in 0.5 g. doses reaching 3.5 to 4.0 g. in two days. Uhthoff reports other cases due to ethylhydrocuprein and thinks that as a therapeutic agent, the drug must be used with caution.

Birch-Hirschfeld's case of ethylhydrocuprein poisoning followed its use in pneumonia. He describes it in detail and discusses it with two cases reported by Pollnow and it is very similar to, or perhaps even a specific instance of quinin amblyopia. The author assumes that ethylhydrocuprein has the same toxic effect upon the ganglion cells of the retina and nerve fibers of the optic nerve as quinin, and also causes constriction of the arteries of the optic disc. Twenty-five other similarly treated cases of pneumonia did not develop amblyopia but the author thinks it due to individual resistance rather than to any small variation or the quantity of ethylhydrocuprein received. Perhaps pneumonia sensitizes the patient to ethylhydrocuprein, and he advises giving it early in the course of the disease and never on an empty stomach. He rejects the suggestion of Fuhner that an arterial dilatant might act as an antidote, because quinin is toxic to the nerves as well as a vasco-constrictor. **Bleich** observed ethylhydrocuprein poisoning followed by complete blindness fifteen hours after ingestion of 0.50 grams of chlohydrate of ethylhydrocuprein.

Pincus speaks of two cases of disturbance of vision after the internal use of optochin. Case I Pneumonia, was given optochin gm.0.25 every three hours, day and night, beginning December 19, at seven A. M. At one P. M. on December 20 (after having had gm. 2.5) he complained of glimmering and darkening of his vision which went on to complete blindness. There were fixed pupils and no light perception. His general condition had greatly improved. On December 21, the central vision returned, but there were greatly contracted visual fields. On the 24th pupillary reaction was pronounced and the visual field enlarged and central vision improved. The ophthalmoscopic examinations had been negative. On the 24th, for the first time, changes were observed with this instrument. The arteries were remarkably narrow, cord-like; the veins were less narrowed; the disc and retina were narmal. January 10th there was slight paling of the disc and irregular spots in the periphery of the retina. His vision improved greatly but he remained hemeralopic to a marked degree. On March 1st the ophthalmoscope showed pale discs, narrow cord-like arteries, which could only be seen a short distance, with white lines on either side of them. The periphery of the retina showed many spots; there were atrophic foci, some with pigment. The whole much resembled the fundus of congenital lues. Several months after this his vision remained in about the same condition.

In the second case, the patient took gm. 2.0 of optochin muriate in fifty-seven hours, beginning February 15th. Then there occurred blindness, and deafness. After several hours the deafness disappeared. Four weeks afterward the patient had light perception, the vision slowly improved, but the patient was completely blind at night.

Both pupils were dilated ad maximum; there was very slight light reaction; good convergence reaction. The ophthalmoscope showed both discs pale and somewhat blurred in outline, the vessels were very narrow, the arteries particularly. The fields were much contracted.

Van der Hoeve and **Mansholt** state that from three to six per cent of those who receive optochin internally, are damaged as regards their sight, but optochin poisoning has been seen very rarely in Holland. A twenty-two year old man previously healthy, was admitted October 7, with right-sided pneumonia. With milk diet, he received six times daily 200 mgr. optochin hydrochlorat, every four hours; some powders were ejected. October 11, the patient appeared to be blind. The optochin was stopped; he had received four grams. On Oct. 17, the patient was free from fever. The pupils were wide and did not react to light. On Oct. 14 retinal edema was found without a red spot in the macula, and without changes of the blood vessels. Oct. 21, the retinal edema had diminished; the discs were pale gray; vision zero. October 23, the edema was limited to the macular region. There was a light perception with very poor projection in both eyes; discs pale gray, indistinctly limited. In the right eye the arteries were narrower than normal; in the left normal. Oct. 27, in both eyes the arteries were narrower, V. R.=1/60, which became 3/60 on November first.

On April 24, V. R=6/50; L.=6/50. The color sense was poor. Blue was not recognized; yellow, red and green sometimes. The discs were gray, the vessels narrowed with visible sheaths. The upward going artery in the right had four bead-like swellings. The visual fields were narrowed. It was difficult for the patient to go about in the evening.

It appears from this case that doses of grms. 0.200 and not more than grms. 1.2 per twenty-four hours with milk diet may be too large.

These writers would limit the use of optochin to cases where the life of the patient is in great danger and where one has to consider if the eventually appearing and remaining visual disturbances are of greater importance than life. It should therefore be used more promptly in old, feeble people. It should also not be postponed till after the third day, as the chances of success are less each day. It should be stopped if the temperature does not become normal after twenty-four hours. It seems probable that the nervous and vascular effects both are produced by the poison. The effect on the vessels seems to be of much longer duration than on the nerves; while clinically, the latter were retrogressing, the vascular ones were still progressing. The optochin treatment is not yet ripe for the general practice and even in the clinic it may not be employed unless with all caution.

Schreiber describes optic atrophy and hemeralopia after the internal administration of optochin. It is a known fact that this substance used internally will cause complete blindness, even in proper dosage. These effects are not transitory, but cause lasting changes in the optic nerve and the retinal vessels.

In several cases quoted, optochin was given very carefully and in very small dosage; but blindness rapidly supervened, lasting several hours to three or four days, the vision slowly returning. There remained, however, as a permanent effect, changes in the discs and retinal vessels, together with hemeralopia and concentric contraction of the visual fields.

If the eyes of all cases in which optochin was given were watched by a competent ophthalmologist, it is sure that these changes would be observed. In one case, hemeralopia was the only change noted.

Arsenic Amblyopia.—**DeHaas** published a detailed clinical and statistical study of diseases of the retina and optic nerve caused by arsenical poisoning, which is important from a hygienic standpoint because of its use in prophylaxis. In the urine of 58 patients having inflammation of the optic nerve he found arsenic 55 times. Among 8,000 patients observed in one and one-half years he found disease of the optic nerve plus leadpoisoning in none, plus albuminuria in 4, plus glycosuria in 3, and plus arsenuria in 22 persons. His statistical material is good evidence for the relationship between arsenical poisoning and optic nerve disease. He gives in a comprehensive fourteen page table the clinical history of seventy cases in which 56 times the clinical diagnosis of neuroretinitis arsenicalis was made and 53 times arsenuria was found. The disease picture of neuroretinitis he describes as follows: In all cases it was an affection of the peripheral construction system, either in the retina or in the optic stalk or in both, unless the lamina cribrosa appears to be an obstacle. Where it was possible to form an opinion of the succession of events, the retinal inflammation came before most of the other changes, but not always. In the early stages the retina showed no single definite change. At first the changes were merely on the optic disc and too slight to be able to distinguish the affection as the classical amblyopia of intoxication. In so far as visible objectively, it was a localized disturbance and seldom complete blindness, remaining as local defects in the general fundus. With chronic cases also occur small pigment changes in the pigment layer of the retina, and in some very old cases there was present a choroidoretinitis. The light perception was but little disturbed. The superficial changes in the retina call for the most careful opthalmoscopic examination. A stationary papillitis increased in a few cases up to four weeks after the removal of the sources of the arsenic, or even first appeared as a retinitis. Retinal hemorrhages were for the most part smaller than a cross section of a medium sized retinal vessel and lay in the vicinity of the optic disc. With the most, the central or paracentral vision was injured. When atrophy takes place the optic disc shows first more severely in the temporal quadrant, and in the more serious cases the entire disc was atrophied; the blood vessels (differing from quinin poisoning) kept their normal caliber. The general fields showed no limitations only central and paracentral scotoma.

During a far reaching study of the literature and on the basis of his own material, de Haas came to the conclusion that in normal urine, arsenic was not present; as an average of 20 similar cases of chronic arsenic poisoning he found 23.9 mg. As_2O_3 (Max. 68, min. 5) per liter.

He concluded that among the causes of the loss of sight following upon diseases of the optic nerve (including glaucoma) arsenic took first place. With regard to the prophylaxis used, he thinks sources of arsenic poisoning, are completely avoidable. The laws concerning the permitted maximal amount of arsenic in tapestry colors must be revised. Also zinc kitchenware can be dangerous. Milk, beer, wine, and water must not be allowed to stand long in zinc pails. Not perhaps on account of the dissolving of the zinc but on account of the arsenic contained in the most of them.

Cohn reports a case of acute retrobulbar neuritis after taking Fowler's solution of arsenic. About 8 drops had been taken in the 24 hours before the impairment of vision was noticed. The left eye, known previously to have been normal, presented a widely dilated pupil, and vision had fallen to 5/18. The optic disc was unaltered, the tension normal. By afternoon of the same day vision had risen to 5/6, but three days later the sight was not entirely clear. After 12 days vision was normal, but a difference in the size of the pupils could be demonstrated by a reduced light.

Lead Poisoning.—The ocular symptoms produced by saturation with lead is the subject of a paper by **Addario le Ferla.** He reports three cases, two occurring in printers and one in a painter. He concludes that the neuritic neuro-retinitic and choroidal lesions described in the literature may or may not be associated with nephritis; that the edema of the macula observed disappears on removal of the poison, that causes it even when the function of the kidneys is normal. The poisoning may cause fatty degeneration of the cells of the ciliary ganglion, and its efferent branches, which may be manifest by the abolition or paresis of the iris reflex to light; the Argyll Robertson symptom with retention of normal accommodation. Loss of the pupil reflex therefore cannot be regarded as pathognomonic of cerebral syphilis. To prevent the effects of saturnism hygienic measures, ventilation and cleanliness of the work room, and washing the hands frequently with water containing sulphuric acid are recommended.

Naphthalin.—Among workers in the manufacture of explosives lesions of the cornea due to exposure to naphthalin compounds are now rare. **Caspar** reports six cases occurring in adults exposed to the fumes of nitro- and dinotronaphthalin. The lighter cases presented a soft gray clouding of the cornea near the horizontal meridian, as shown in Fig. 14. The reflection from the corneal surface was impaired and the vision was lowered to 5/10 to 5/50. preventing continuance of labor. In the more severe cases the central part of the cornea became quite clouded, altho the upper and lower margins remained clear. Vertical stripes were sometimes seen in the affected portion. The corneal sensibility was impaired or lost. The eyes were free from pain, the tension remained normal and the conjunctiva seemed unaffected. With avoidance of further exposure, and treatment, the condition improved, but full vision was not often regained. **Fusita** reports his experience in napthalin poisoning with twenty charts of the visual fields.

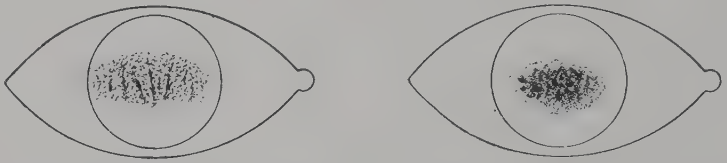

Fig. 14.—Distribution of corneal lesions in workers exposed to naphthalin fumes. (Caspar).

Mineral Oil Amblyopia. — **Birch-Hirschfeld's** fourth case was one of amblyopia caused by "granugenol," Knoll, injected into the pleural cavity in empyema. The patient was blinded for two days and suffered severe symptoms, but, when a thorough examination was made three weeks later, he seemed entirely normal except for a slight restriction of the fields of vision both for colors and for white. Apparently the peripheral nerve cells or fibers were the more severely affected. Since granugenol is a mineral oil, the author discusses other cases and concludes that mineral oils are not safe, if absorbed in large quantities because of a possible effect on the eyes.

Ammann reports injury of the eyes of certain workmen in a shoe factory from a substance used as a substitute for acetone oil in making patent leather parts of shoes. The injurious element in the new substance seemed to be chloracetone. In another establishment, a dye works, ammonium persulphate had been used instead of the usual sodium chromate. None of the workmen experienced any ill effects, but the proprietor developed a vesicular eruption on the skin, and blisters on the corneas. The man from whom the chemical was bought also displayed the same idiosyncrasy to the vicinity of the chemical, but the men handling it escaped.

Ptomain Poisoning.—In the same paper **Ammann** also describes a case in which ptomain poisoning from rotten beef caused ulceration of the cornea and fatal gastro-intestinal intoxication in one man. His son survived the intoxication, but he also developed ulceration in the cornea, reducing vision permanently to 1/25 right and finger counting at 20 inches left. Pflüger has publisher a similar case from eating spoiled cheese. Hegner has also reported a case of necrosis of the corona after injection of salvarsan. Wessly and Kollner injected an alien serum intrlamellar in a rabbit's cornea and parenchymatous keratitis developed. The incubation period of from 5 to 9 days was the same as in Ammann's ptomain poisoning case. In his lecture of the Colonial Medicine Course **Terrien** discusses filaria, hemeralopia and toxic amblyopia.

The Optic Nerve

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This section carries the literature from June, 1918, to August, 1919. Closely related topics will be found in the section on Visual Tracts and Centers. For previous references see A. J. O., vol. 2, September, 1919, p. 166.

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DIGEST OF THE LITERATURE

Position of Fibres in Optic Nerve.—Evidence regarding the connection of the peripheral fibres in the optic nerve with the periphery of the retina was obtained by **Seidel** in this way. When a seeing eye was to be enucleated he injected a novocain solution immediately around the optic nerve trunk. The peripheral field of vision had previously been normal, but 15 minutes after

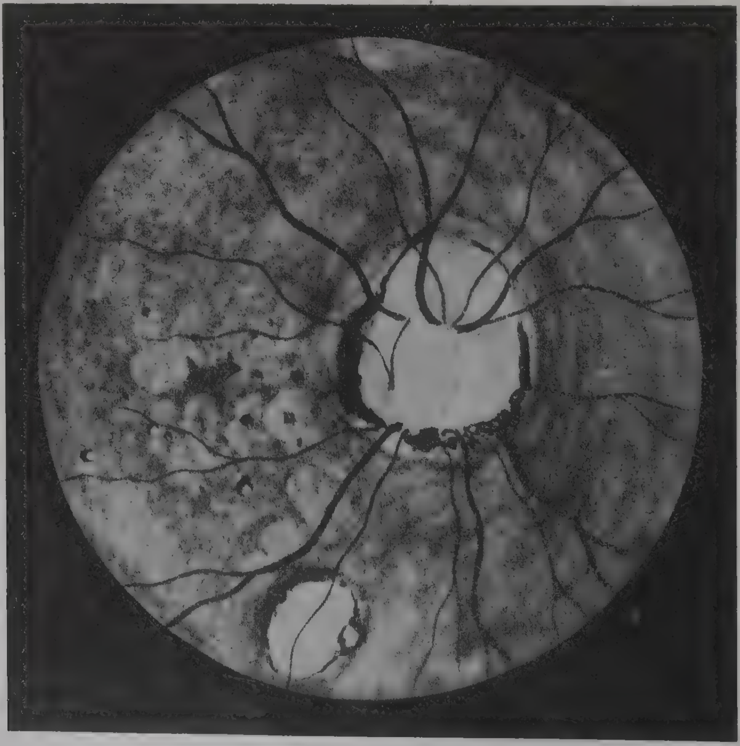

Fig. 15.—Coloboma of optic nerve and choroid (Fusisimi and Inatomi).

the injection began to be narrowed. In 45 minutes the greatest narrowing of the field had occurred; and at the end of one hour the recovery was complete. Central vision remained entirely unaffected throughout. Siedel's results confirm the generally accepted theory of the distribution of the fibres in the optic nerve trunk.

disc and the coloboma. The optic disc was irregular in outline and its lower half showed a broad groove sloping outward. Near the lower outer margin in the grooved part of the disc was a characteristic hole 3 D. in depth with a tiny vessel curving over its outer margin and two seen crossing the bottom. The vision of this eye was 6/9, its fellow had light perception and exhibited a coloboma of the iris, strands of tissue attached to the posterior capsule of the lens and a reflex such as would be obtained from coloboma of the fundus that could not be seen for opacities.

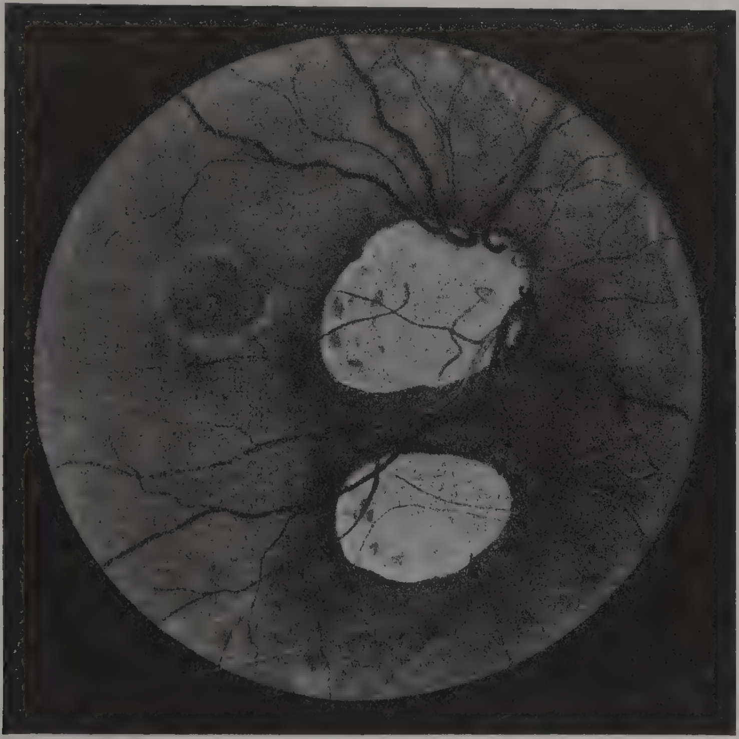

Fig 16.—Coloboma of optic nerve and choroid (Fusisimi and Inatomi).

Anomalies—Coloboma and Pits.— The two cases of coloboma reported by **Fusisimi** and **Inatomi** are similar; and peculiar in that the coloboma extends beyond the nerve head both into the adjoining fundus and back in the nerve trunk. In each case, too, there was a coloboma of the choroid somewhat smaller in area and situated in the usual position below the nerve entrance. These and other details are shown in Figs. 15 and 16. In the case exhibited by **Holloway** and **Bertram** there was in the right eye typical coloboma of the choroid in the lower periphery with an area of choroidal disturbance beside the disc between the

The paper of **Van Duyse** and **Van Lint** and their separate communications to the Belgian Society report two cases of hole in the disc atypical coloboma, one of them also showed hemorrhage in the macula while in the other the discs of both right and left eyes showed holes symmetrically placed in the lower temporal quadrant. These writers believe such pits in the disc are colobomatous in character. They may be regarded as due to excessive proliferation of parts of the perivascular and mesodermal tissue.

Two cases are reported by **Damel** and **Natale.** The first presented a slight colobomatous extension at the upper temporal quadrant of the disc with a pit ¼ the diameter of the disc with vessels entering and emerging from it. In the second case the outline of the disc was normal but at its lower margin was a pit ¼ by ⅛ d.d. long axis horizontal.

Pseudo-Neuritis.—The case of pseudoneuritis reported by **Basterra** was that of a boy of 11 years who had hyperopia 8 D., astigmia 1 D. and vision of 2/3 in each eye. The nerve heads were prominent almost the color of the surrounding fundus, striated and with concealed margins. The visual fields were normal and no evidence appeared of any disease likely to cause optic neuritis.

Fisher showed a case of pigmented connective tissue in front of the optic disc of the left eye. The eye was blind. The man had been wounded by a shell in the face, but his history showed he was blind in this eye before the injury; hence the wound was thought not to have been a cause. The disc was hidden by the mass which was 3 to 5 D. above the fundus level. It was thought to be due to trauma, or inflammation, or to a defect of a congenital nature.

Physiology.—Before the Vienna Ophthalmological Society, **Ruttin** read a paper concerning the specific energy of the optic nerve. Magendie stated in 1829 that when the optic nerve was injured there occurred a light sensation. Feilchenfeld cut the optic nerve; there was pain but no light sensation, and irritation of the optic stump caused no light sensation. Hess performed an enucleation without any anesthetic. The patient was requested to note should there be light sensation, but there was none. The retina reacts to an irritation, but the optic nerve only transmits the sensation.

Ruttin examined a patient who had the day before become suddenly blind as a result of embolus of the central artery of the retina: there was no light perception. Faradization of the good eye produced light sensation but not in the diseased eye. One might assume that the optic nerve had not as yet degenerated, but the retina had ceased functioning on account of ischemia. This case proves that the optic nerve cannot produce sensations of light on irritation.

Retrobulbar Neuritis.—The case of acute retrobulbar neuritis reported by **Rönne** was characterized by marked variations in the visual field. The right eye was affected and at first the lower nasal quadrant of the field was lost. Then the whole nasal half; but within a month had been regained, except that a scotoma for red remained in the upper nasal quadrant. A month after that the field had become quite normal with vision of 6/9, the same as in the left eye.

In the case reported by **Dimitry** arsphenamin was given for the retrobulbar neuritis, and this was followed by paraplegia and evidence of acute transverse myelitis the next day. However, the dose of 0.06 grams was repeated a week later and a larger dose subsequently. Within a month the patient, who had been on mercurial inunctions and iodid, was markedly better, and subsequently reported that vision and ability to walk were practically perfect. The question of salvarsan injury to the optic nerve is discussed by **Zeissl,** who has met with two cases, in one of which optic neuritis seemed to follow salvarsan injections, and in the other to be increased by it. **Mukai** also reports neuroretinitis following salvarsan injection.

From his work on the pathology of the optic nerve **Igersheimer** concludes that there are two forms of fasicular defects, one most marked peripherally and one in the intermediate zone of the retina often increased at the blind spot. He holds this arrangement explains concentric contraction, ring scotoma and enlargement of the blind spot.

Aubaret cites a case in which vision was disturbed and no lesion could be found by examination of the eyes. After careful study of X-ray plates fine spicules of bone which pressed on the optic nerve, and optic tracts were discovered. The careful study of X-ray plates in all cases with visual disturbances, following trauma, without ocular changes is urged.

Butler reports a case of acute retrobulbar neuritis occurring in a baby of 17 months, following influenza. The child was normal until six weeks before the condition of the eye was noticed, when he had fever and a convulsion during an epidemic of influenza. When seen the pupils did not react to light and the child was blind; discs pale, vessels normal. Three months afterwards the child was still blind.

Fulminant Blindness.—Three additional cases of the fulminating blindness of Graefe are reported by **Hirschberg**. Briefly the symptoms are as follows: Bilateral sudden blindness coming on in an hour, a few hours or even two or three days. Rash, fever, gastric catarrh, angina, but without appreciable loss of health. The pupils are wide and immobile. The ophthalmoscope shows a very plain, but not exaggerated, change in the macula, fine dimming of the borders, the arteries are small and the veins are very full and tortuous. It affects children and young people. Two cases recovered spontaneously while the other went on to complete amaurosis. The seat of the trouble seems to be the nerve trunk. It is not amenable to treatment. One case was thought to possibly be due to a chronic pachymeningitis. After recovery the optic disc remains pale.

Papilledema and Optic Neuritis.—Although the more careful students of conditions of the optic nerve head seek to discriminate sharply between edema commonly due to increased intracranial pressure and inflammation arising from many different causes, there is great confusion in the literature. Many writers attempt no separation of cases into the two classes, or imply that it is a matter of merely verbal or academic importance. Often the heading neuritis is found to refer to a case of choked disc, or the latter term is applied to a condition presumably inflammatory in origin.

The differential diagnosis of choked disc and neuritis in the early stages of their development is the subject of a paper by **Behr.** He sums up the chief differences thus:

Choked disc: No disturbance of visual acuity or fields, normal dark adaptation, nerve fibers transparent, choroidal margin visible, lamina cribrosa visible, physiologic cup retained, vessels lie on swelling, perivascular space invisible.

Papillitis: Often impaired vision and scotoma, great disturbance of adaptation, clouded or hidden disk margin. Lamina invisible, vessels obliterated, or covered in clouded papillary tissue, abundant white vessel sheaths perceptible.

Papilledema.—In an extensive paper on choked disc and dilatation of the ventricles in brain tumors, **Bollack** states that the size of the tumor is of minor importance. The location is of much greater importance; those tumors situated in the posterior portion of the brain and in the cerebellum in particular are most apt to cause choked disc and also dilatation of the ventricles.

Ventricular hypertension is the cause of ventricular dilatation. The latter has not necessarily any connection with intracranial hypertension. It undoubtedly plays an important part in the origin of the syndrome in which choked disc is a symptom. This condition manifests itself automatically by dilatation of the ventricles and clinically by certain symptoms.

I. Consideration of anatomical findings.

First—Relation of choked disc to the situation of the tumor. In twenty-three cases of tumor with choked disc the locations were as follows: Of the convexity, 7; of the posterior lobes, 14; in the region of the lateral ventricles, 2.

Second—Relation of the ventricular dilatation and the situation of the tumor. In fourteen out of twenty-two cases the tumor was situated in the posterior lobes.

Third—Relation of the choked disc and the extent of the ventricular distension. Dilatation of the third ventricle is always followed by choked disc while dilatation of the lateral ventricles is only occasionally so followed.

Fourth—Relation of the duration of the choked disc and the grade of the ventricular cavities.

a. Tumors where the choked disc dates from two weeks to three months.

b. Tumors where the choked disc

dates from three months to one year.

c. Tumors where the choked disc dates from more than a year.

2. Concerns the cause of hypertension and dilatation of the ventricles in the course of cerebral tumors.

It appears that dilatation of the ventricles necessitates often a condition of increased tension in the ventricles. The equilibrium which normally exists between the tension of the ventricles and that of the subarachnoid is interrupted. The predominance of the ventricular tension permits the dilatation of the ventricles to become manifest. The disturbance caused by a tumor in the normal intracranial pressure can alone cause ventricular hypertension. This is brought about in the following ways:

First—By disturbances in the production of the cerebrospinal fluid.

Second—By disturbance of the resorption of this fluid.

Third—By disturbance of the circulation of this fluid.

In the beginning ventricular hypertension is confined to the third ventricle.

3. Some clinical manifestations of ventricular hypertension in the course of cerebral tumors accompanied by choked disc.

The true hypophysis syndrome in the course of cerebral tumors has been described by Cushing (1911); the Frohlich syndrome has been described in the course of ventricular hydrocephalus.

The systematic investigation of the symptoms has been interpreted by some as the hypophysis syndrome; by others as the infundibular syndrome (tachycardia, arrythmia, somnolence, polyuria, increased thirst).

The anatomic findings and the clinical facts show the constant presence of ventricular hypertension and dilatation in course of tumors accompanied with choked disc.

4. The rôle of ventricular dilatation in the pathogenesis of choked disc. The author gives, first, a critique of the pathogenic theories. The mode of action of ventricular hypertension:

(1) The relations of the thin walls of the infundibulum with the sub-arachnoidian tension, and in connection with the vaginal space of the optic nerve, thus causing, indirectly, choked disc.

(2) The intimate anatomical connections which exist between the walls of the third ventricle and the optic pathways, the chiasm in particular, cause us to think that the ventricular hypertension can act directly upon the optic nerve, either by direct compression of the infundibulum or the chiasma (an hypothesis not well founded), producing either bitemporal hemianopsia or optic atrophy, but not choked disc; or can act by irritation of the sympathetic nerve filaments which arise from beneath the optic pathway, or may act by obstructing the lymph circulation of the chiasma and following this, that of the optic nerve.

The author here discusses at length the embryologic, anatomic and histologic relation between the third ventricle and the chiasm, supported by reports of a number of cases.

The conclusions reached by the discussions are that there are two principal points to be considered: First, the predominence of the involvement of the lymph circulation of the chiasm; second, cases of choked disc with constant neuralgic infiltration of the prechiasmatic ependymal space, and cases of choked disc without this lesion.

On the point of the pathology of choked disc we can say, in conclusion, that the persistence of the ventricular hypertension and dilatation constitutes a clinical or anatomical part; that the intimate embryologic, histologic and anatomic connections between the third ventricle and the chiasm constitute a second part which indicates that ventricular dilatation plays an important part in the formation of papillary stasis.

Pichler describes a traumatic choked disc in a young man previously in good health. He was injured in a snowslide and remained for some time unconscious. He recovered consciousness promptly after being liberated. The following day there was severe disturbance of the vision which rapidly increased when he attempted to get up. On the eleventh day when he attempted to sit up his vision almost disappeared. This was preceded by signs of cerebral irritation and coma for a time.

There was exophthalmos of the right side and choked disc on both sides and numerous hemorrhages on and about the papilla and a star-shaped figure at the macula. Neuritic atrophy followed, accompanied by a network of newly formed capillaries on the papillae. The injury evidently caused cranial fracture and cerebral hemorrhage, probably from the middle meningeal artery. The choked disc and the exophthalmos were probably due to the cerebral hemorrhage which very possibly involved the sheath of the optic nerve. The new-formed vessels on the discs were probably caused by the numerous retinal hemorrhages.

Berrisford, in discussing the etiology, pathology and pathogenesis of choked disc, says inflammatory conditions of the optic papilla may be grouped under three clinical entities—neuroretinitis, descending optic neuritis and choked disc. The term neuroretinitis, according to common usage, is restricted to those cases which are the result of grave systemic disorders, such as diabetes, nephritis, arterio-sclerosis, etc. The terms, "descending optic neuritis" and "choked disc," include changes in the optic nerve head that arise as a consequence of intracranial disease.

Choked disc occurs in 80 per cent of brain tumors (Gowers), more frequently in cerebellar tumor, less frequently in tumors of the convexity. The relative infrequency of choked disc in tumors affecting the convexity is doubtless due to the protection afforded the basal part of the brain by the dense tentorium. Choked disc is an early sign in tumors of the cerebellum and base; in tumors of the frontal lobes it is a late symptom. Unilateral choke is usually due to a tumor situated near or extending to the chiasma or optic nerve of one side.

The primary cause of choked disc is uncertain. There is a distension of the vaginal space. In a majority of the cases there were inflammatory signs in the sheath spaces. Intrafascicular edema is the commonest change. There is bowing back of the lamina cribrosa, but this returns to its normal position later. The atrophy which frequently follows is a neuritic degeneration consisting of septal thickenings with a slow disappearance of nerve fibers and neuroglial proliferation. As to the pathogenesis, Graefe thought it arose as the result of a tumor exerting pressure upon the cavernous sinus, producing congestion of the ophthalmic vein.

Lamb reports a case of double choked disc with concomitant symptoms resembling brain tumor. There were excruciating headaches, photophobia and projectile vomiting. The patient was apathetic; there was ptosis of the left lid, not of a paralytic type, but due to intumescence of the lid. The face was swollen and gross, the skin having a heavy, greasy appearance. V. R., 6/60; V. L., light perception. There was double neuroretinitis, choked disc, worse in the left eye; reflexes and spinal fluid normal. The X-ray showed marked corrugations of the inner tables of the skull; the sinuses normal. There was slight hemianopia, left eye, lasting a short time. She was given luetin, 2 grs., and posterior pituitary, gr. 1/10. Six weeks after this she was greatly improved.

By pseudotumor cerebri we understand a syndrome that presents all the cardinal symptoms of brain tumor, yet the subsequent clinical course of the disease, whether it leads to an improvement or to a cure, does not confirm the primary diagnosis, and the correct diagnosis can only be made with absolute certainty by necropsy. **Lutz** gives a summary of cases that have been reported where all the symptoms of brain tumor were present, but where the necropsy indicated an entirely different cause. He reports a case of his own, that of a woman who fell suddenly ill, without any increase of temperature or signs of infectious meningitis, and presenting all the symptoms of brain tumor, choked disc, headache, vertigo and vomiting. These symptoms, after having appeared most alarming for fourteen days, slowly receded, the choked disc included, so that four weeks later the patient felt normal.

A case of unilateral choked disc in a 10-year-old boy was presented by **Krauss**. The swelling was 6 dioptres with small hemorrhages. The swelling disappeared under potassium iodide, although the Wassermann was negative, and an area of choroiditis was found at the lower outer side of the disc.

Bilateral papilledema relieved by opening the pituitary fossa through the sphenoid is reported by **Lecene** and **Morax** in a boy 13½ years, who presented the Fröhlich syndrome. Sugar tolerance was increased, the Wassermann was negative. In one month after operation choking of the disc had entirely disappeared and the patient had remained six years and one-half in good general health. **Thomas** records two cases in which the sequence of pathologic change appears to have been diseased tonsils, sinus involvement extension of infection to the pituitary body and bilateral swelling of the optic disc. The first, in a girl 12½ years old, terminated in death and the postmortem revealed a cyst of the cerebellum. The second in a woman of 49 ended in recovery after removal of the tonsils and draining the sphenoidal sinus.

A case of choked disc followed by death is described by **Santos Fernandez.** There had been intense headache for five months, loss of equilibrium and subjective noises, tendency to fall if eyes were fixed upward, vertigo when lying down and turned on one side. Ophthalmoscopic findings were those of choked disc. The patient moved about very well, his urine was normal, but he died next day from cerebral hemorrhage. The paper of **Wright** is a general one on the inflammations and atrophies of the optic nerve.

Optic Neuritis.—Among 227 cases of disease of the optic nerve, **Kirkpatrick** tabulates 60 of acute neuritis. Of these patients, 42 gave a history of consanguinity, but as the general population gives such a history in 60 per cent of the cases seen, not much significance could be attached to it. Twenty-one suffered from pyorrhea, 3 had malaria and 12 dysentery within the last year. Thirty-one had "venereal disease," 1 had albuminuria and 1 glycosuria.

Fleming raises the question whether simple concussion of the brain can give rise to optic neuritis. He reports the case of a man thrown from a horse, striking the back of his head, rendered unconscious, and with no memory of happenings for a week, followed by headaches, and eight weeks after the accident found to have optic neuritis with exudate around the central retinal vessels and one hemorrhage in each eye. Lumbar puncture gave relief.

Arnold, discussing optic neuritis in typhus fever, says in 244 cases of this condition he found 144 cases of optic neuritis; cases of slight blurring of the optic papilla were not taken into consideration. The first changes in the papilla are observed in most of the cases on the tenth to twelfth day; the fully developed neuritis is observed during the last days of the high fever at the time when the exanthem is disappearing. Hence, if the fundus examination be made too early in the disease, it will be negative. This explains why some observers have reported only venous stasis, this later condition being observed in all cases without exception which were examined. The usual changes of optic neuritis are here observed. The disc is swollen and hazy in outline, veins tortuous and swollen, arteries almost normal. In some cases a picture of choked disc is observed; this is most apt to be seen in robust cases with cerebral complications. In others, retinal hemorrhages occur. These are apt to be in the vicinity of the disc or macula.

There is much increase in the amount and pressure of the cerebro spinal fluid. The neuritis is usually on both sides, but more developed on one side than the other. In most of the cases, on convalescence the neuritis disappears. Frequently, however, it lasts longer than all the other complications—from two to three months. Where the choked disc continued there were usually other symptoms of brain pressure, such as vertigo, headache, slight deafness and frequent vomiting. The prognosis of optic neuritis in typhus fever is favorable. There is a positive hemolysin reaction of the spinal fluid, which begins the second week of the disease and reaches the maximum with the disappearance of the fever; the optic neuritis appears at the same time as this reaction; also there is increased permeability of the meningeal blood vessels to the serum at this time.

The development of the optic neuritis in typhus fever is considered of great clinical importance. The connection of the optic nerve into the eyeball is very closely associated, from an anatomical standpoint, with the subarachnoidian space, which latter reaches up to the globe of the eye. When the meninges are inflamed, or where increased pressure occurs of the cerebro-spinal fluid, this space is involved and hence the changes described occur in the disc. The neuritis will be observed oftenest in children and in those of middle age. In 100 cases of typhoid fever no case of optic neuritis was observed, though in some cases with meningitis one can observe a slight blurring of the disc margin.

The changes observed in typhus fever have never been observed in typhoid, and for this reason optic neuritis becomes an important diagnostic symptom. In the later stages of typhus, when the exanthem is no longer present, it offers much help in making a diagnosis. The Weil-Felix reaction takes time and requires an efficient laboratory. This makes the eye findings of great diagnostic importance.

Even after convalescence it is frequently possible to say the patient had suffered from typhus fever on account of the optic neuritis present. I have been impressed with the value of this symptom in a great many cases. The outcome of the neuritis is frequently atrophy.

Veasey reports a case of acute retrobulbar neuritis complicating herpes zoster ophthalmicus. On the seventh day the patient observed the vision of the right eye was almost entirely gone. No ophthalmic changes noted at this time. Next day the vision was entirely abolished. There was no involvement of the cornea or the nasal branch of the fifth nerve. Blood and accessory sinuses normal; slight albuminuria. Four weeks later peripheral vision had returned, but there was a large central scotoma. The disc was pale and atrophic. The remaining vision rapidly disappeared and the nerve became completely atrophic.

Henneberg reports a case of cervical myelitis with involvement of the optic nerves and Brown-Sequard paralysis. Examination showed a slight left abducens paresis and also paresis of the right arm and leg. The reflexes of the right arm were increased; the right abdominal reflex reduced; the temperature sensation of the left leg was reduced; otherwise the sensibility was intact. Blood Wassermann was negative; spinal fluid at first was positive, later negative. After inunctions he was discharged as recovered. The right pupil and palpebral fissure were preserved and there was progressive atrophy of the optic nerve. Later he had three doses of neosalvarsan, gms. 0.15; after this he became completely blind.

He died ten months after the beginning of the disturbance of his vision from diaphragmatic paralysis. Postmortem showed a myelitic focus in the right half of the cervical cord from the fourth cervical segment to the second dorsal. In the sixth cervical segment the whole right half of the cord was destroyed; also there was destruction of the left posterior column. The optic nerve was destroyed; there were collections of granular fat cells in the lymph sheaths of the optic nerve and thickening of the adventitious connective tissue.

This is not syphilis, but a case of genuine myelitis. Similar cases are described as neuro-myelitis-optica by Devic. The author recommends the term optic myelitis. Oppenheim says that the most remarkable thing about this case is the connection of the myelitis with the atrophy of the optic nerve. This gives the case a unique position, provided the salvarsan had no connection with it. There may be a simple myelitis which originates as a sequel to syphilis.

A case of acute optic neuritis with acute myelitis arising from influenza is reported by **Jano**. The patient was a woman aged 27; vision was first impaired but subsequently recovered. But the paralysis of the bladder, intestines and lower extremities continued at the time of the report.

Sherer reports a case of neuroretinitis following thyroidectomy in a woman of 32 years. She had exophthalmic goitre five years before for which thyroidectomy had been done, resulting in a cure. She developed sudden blindness in the left eye and had been having, previously to this, frontal headache and eye fatigue. For two months before the examination she had had severe pain on the left side of the head and left exophthalmus. There was no light perception; pupil dilated and fixed. The fundus of the right eye was normal; the left showed a choked disc of 3 diopters; the veins were greatly distended and tortuous; the arteries were small and pale. The urinalysis and Wassermann blood reaction were negative. There were no classic signs of exophthalmic goitre such as Graefe's or Dalrymple's. After treatment in hospital with bromides, alteratives and pilocarpin sweats, she recovered. In two months she was normal.

Veasey reports two cases of unilateral optic neuritis. In one, the condition followed two months after a cataract extraction of the right eye. Vision which was 6/12 with correction was reduced to 6/45 and could not be improved. The urinalysis was negative, as was also the examination of the nasal accessory sinuses. The fundus of the fellow eye remained normal. The patient was given sweats, mercury and iodides, the vision returning to 6/12.

In the other case the patient received a blow on the forehead three inches above R. E. three weeks before being seen. One week before this she noticed fogginess of the vision of the right eye. Two days before consultation only light perception remained. This was the condition when first seen. Examination of the fundus showed an optic neuritis of the right eye, the left being normal; sinuses normal. She was put on mercury by inunction and iodides. In a few days improvement began. About six weeks after she was first seen the swelling had subsided and the disc was pale. Injections of strychnia were commenced. The vision was 6/5 notwithstanding the atrophy.

White thinks that the importance of nasal accessory sinus disease is not yet fully comprehended. The usual opinion is that the seat of the trouble may be determined on a casual nasal examination. Pus, polypoid tissue or caries was formerly looked for, but now we recognize the importance of hyperplasia—that is, a rarefying osteitis associated with inflammatory swelling and fibrous thickening of the mucous membrane, lining the accessory sinuses. This is brought about by long-continued hyperemia. Examination of the nose is negative when the hyperplasia does not involve the middle turbinate.

The importance is great of a thorough comprehension of the pathologic conditions about the sphenoid sinus. This sinus varies greatly in size in different individuals. The pituitary body, optic chiasm and nerve are in relation to the superior wall; externally lie the abducens, trochlear ophthalmic and maxillary nerves, cavernous sinus and internal carotid artery. The optic nerve varies in vulnerability. In some cases it is separated from the sphenoid sinus only by a paper thickness of bone. Malignant disease of the sphenoid has caused atrophy of the optic nerve in several reported cases.

Writers up to ten or twelve years ago laid great stress on the intimate relation of the optic nerve to the accessory sinuses and felt that pressure was the all-important factor. The growing comprehension of toxemia and hyperplasia is interesting. The extreme promptness with which recovery of the optic nerve takes place following evacuation of the sinuses is good evidence of the toxemia as a cause, as is also the fact that the macular fibers are selected for specific action by the inflammation.

It has been noted that probing of the sphenoid causes increase of the fundus congestion. It is good practice to open the sphenoid in cases of optic neuritis or choked disc showing paracentral scotoma. Gradle's view as to the etiology of involvement of the optic nerve from disease of the accessory sinuses is as follows: The infection passes from the sinus periosteum through the diploic veins and lymph channels to the orbital periosteum; thence by continuity to the intracranial portion of the dura of the optic nerve, or possibly through the periosteal or dural veins, directly to the central vein of Vossius. If the dura alone is involved, causing pressure upon the periphery of the optic nerve within the canal, the peripheral bundles alone will be involved and an enlargement of the blind spot will result. If the process extends further and involves the central vein of Vossius, surrounding it by an edema, the neighboring nerve bundles will suffer, resulting in involvement of the papillomacular bundle and hence producing a central scotoma.

The eye symptoms, due to optic nerve involvement of multiple sclerosis and sinus blindness, which have previously been considered different diseases, are the same, one being an advanced stage of the other.

The uselessness of negative findings is great. A case of Caldwell's illustrates this. During a sea voyage loss of vision occurred in the individual which was preceded by violent pain, first in one eye and then the other. He was treated in various hospitals for two years. His condition was at last correctly diagnosed and the pain relieved by draining the sphenoid sinus; but too late to save the optic nerve, which had atrophied. A number of cases are reported, substantiating this article.

Langdon reports a case of loss of vision from acute sphenoiditis with recovery. The patient had had grip, with pain about right eye and brow for ten days. The vision in the right eye was fingers at one foot; left eye 6/10. The right disc was somewhat hyperemic with blurred nasal margin. The right field showed only an irregular light field; the left field was normal except for a slight contraction for colors. Nasal and X-ray examinations were normal. After a later examination, in which cocain was used to the right ostium, there was a sudden improvement in vision. The posterior end of the right middle turbinate was removed and a small hole was drilled through the front wall of the sphenoid sinus without finding any pathologic secretion. The vision improved with the washing of the sphenoid. In ten days vision had greatly improved and the disc hyperemia had quite disappeared.

That this was an involvement of the optic nerve from a sphenoidal sinusitis seems beyond all doubt: yet there was no pathologic secretion on tapping the sinus, and the X-ray was normal. It seems there must be a form of involvement which gives a clear secretion. It is thought to be a question as to whether negative X-ray examinations and investigations of the nasal chambers in the sense of finding in the latter no purulent secretion is sufficient to exclude the presence of some types of ethmoiditis which might be the cause of optic nerve changes.

Libby reports a case of binocular optic neuritis in a woman of 40 years, apparently due to alveolar focal infection associated with nasal blocking. On May 25, 1918, there had occurred a sudden loss of vision in each eye, the right quickly recovering its sight, but not the left. Physical examination was normal. Treatment of indicanuria and two months' rest restored the vision to normal. Then occurred an acute rhinitis, when vision again dropped. When this subsided vision again became normal. A devitalized tooth was removed which showed streptococcus. A deflection of the nasal septum was found. The disc margins were obscure and hyperemic and slightly swollen. Vision 5/5 each. On September 11 a submucous resection was done. October 4 the disc margins were sharper and hyperemia gone. Vision 5/3 in each eye. October 19 seven devitalized teeth were drawn, two showing streptococcus viridans. December 6 the discs were normal; vision 5/3. On February 10, 1919, the vision of the right eye suddenly fell to 5/10. A hyperplastic ethmoiditis was found at this time, together with empyema of the left sphenoid. On February 20 complete exenteration of the anterior and posterior ethmoidal cells was done. On March 3 the vision was: left 5/4, and on April 16, 5/5.

Hematoma of the optic nerve sheath (editorial, Medical Record, v. 96, p. 1055) may succeed either a cranial traumatism, accompanied by subdural hemorrhage or a spontaneous hematoma of the sheath. Cranial traumata are the most frequent. It must produce severe enough meningeal hemorrhage for the blood to infiltrate into the optic nerve sheath.

Some are of the opinion that fracture of the optic canal is necessary for the formation of a vaginal hematoma, the hematoma being usually unilateral would seem to make it improbable that such a condition is essential. It is more probably true that the source of blood in the optic sheath is a subdural hemorrhage, that fracture of the optic canal is uncommon and that instances of hematoma purely of the sheath have no etiologic value.

In spontaneous meningeal hemorrhage is to be found all the causes for hematoma of the optic sheath. Cerebral hemorrhage, accompanied by a subarachnoid collection, should be mentioned, as also hemorrhagic pachymeningitis, rupture of an aneurism and conditions accompanied by circulatory disturbances capable of causing hemorrhages, such as diabetes, Bright's disease and scurvy. Primary hematoma of the optic sheath is excessively rare.

Although he reports a case, **Welton** believes that optic neuritis from infection in the tonsils is infrequent. His patient, a girl of 17, had complained of a blur before the eyes eighteen months before, which had recently been worse. The right eye showed moderate swelling of the optic nerve, extending one-half disc diameter beyond the margin. The fields of vision were contracted for blue, red and green. She was markedly anemic. Removal of the tonsils was followed by immediate relief of the symptoms, the disc becoming almost normal in three months and quite so later.

Optic Nerve Atrophy—Etiology.—Atrophy of the optic nerves produced by loss of blood is the subject of a paper by **Oyenard**, who has seen one case of total atrophy following metrorrhagia. He also reports in detail the case of a woman of 45 who after provoked abortion bled to unconsciousness. Regaining consciousness she saw things in a mist, and three days later vision was reduced to counting fingers at one meter. Subsequently central vision rose to 2/3 in the right eye and 1. in the left. but the fields of vision were greatly narrowed. **Garcia del Mazo** reports optic atrophy consecutive to neuritis following sudden suppression of menstruation by emotional shock.

In the case reported by **Werner** the patient had fallen from a horse and after a period of unconsciousness, two hours or less, found he was blind in one eye. At first there was no change discovered in the fundus, but after 11 days there was some evidence of optic atrophy.

Ducamp has reported two cases of optic atrophy accompanying the hypophyseal syndrome of Fröhlich. One patient was a man of 33 with bitemporal hemianopsia; the other was a man of 24 who had optic atrophy without evidence of compression of the chiasm. Radiographs showed enlargement of the sella turcica supposed to be due to tumor of hypophysis. **Behr** has reported the case of a young woman in whom the disease of the hypophysis was traumatic, following an attempt at suicide which caused a fracture of the anterior wall of the sella. In another case a blow behind the ear had produced optic atrophy and bitemporal hemianopsia. The atrophic changes in the optic nerves were evident four months after the injury, in the right eye and two months later in the left.

In the case reported by **Hensen** atrophy of the optic nerve was ascribed to a toxin from tape worm. The patient was a man aged 36. Vision was reduced to 1/5. After a dose of extract of Filix mas he was reported as again fit for military service. Two months later the same thing recurred, vision again improving after treatment. But a year and one-half after that vision was again reduced to 1/5. Examination of urine, blood Wassermann and radiographic proved negative. But vision in the left eye fell to 6/60. The disc was very white visual fields contracted. Color perception good. No central scotoma. After renewed treatment vision rose to 6/36, but the visual fields remained unchanged.

Imamura and **Ichikawa** report two cases of familial atrophy of the optic nerve with tremor and mental impairment. The parents and four of the six children were healthy. A brother and sister developed at puberty visual disturbances which progressed rapidly. The symptoms closely resembled those of Leber's hereditary optic nerve atrophy. There were incoordination in the movements of the eyes and asymmetry in the innervation of the face. In the young woman there was tremor of the whole body and all the finer movements of coordination were slow and awkward. The gait and reflexes seemed normal. There was pronounced mental impairment. **Nakamura**, also, has written on familial optic atrophy.

Kirkpatrick reports 3 cases of optic atrophy apparently due to quinin. A man of 30 had treated himself for malaria for eight months and vision was reduced to light perception. The other patient, a woman of 23, had been given an injection of quinin for an attack of malaria. Her sight failed ten minutes later and at the end of three months vision was reduced to perception of hand movements and the nerves were atrophic and slightly cupped. The third patient, a man of 35, swallowed quinin by mistake for epsom salts. He was unconscious for 24 hours and then found he was blind. Sight improved for a year, reaching 0.6 in each eye with a contracted field. (See p. 196).

In his general statistical study, Kirkpatrick includes 61 cases of optic atrophy secondary to neuritis, among which 47 showed sanguinea, 25 pyorrhea, 4 malaria, 1 dysentery, and 45 venereal disease. His cases of primary atrophy numbered 20, 14 patients with consanguinity, 11 with pyorrhea, 1 with dysentery and 14 with venereal disease, apparently syphilis. Among atrophies secondary to retrobulbar neuritis 60 showed consanguinity, 35 pyorrhea, 6 malaria, 3 dysentery and 68 venereal disease. A rather striking feature of these cases was the presence of indican in the urine of about one-third. Whereas among the rice eaters in southern India in good health indican was not commonly found in the urine.

Treatment of Optic Atrophy. For the treatment of tabetic atrophy **Campbell** and **Ballance** suggest the use of intracerebral injections of salvarsanized serum.

They report cases of paresis arrested by this means. The object in the latter condition being to introduce salvarsanized serum into the cranial cavity in such a way as to admit of the serum coming into contact in the most direct way with the brain cells, which are in danger of destruction by the syphilitic virus. There is a general belief that while anti-syphilitic remedies are useful in interstitial syphilis, they are quite ineffective in parenchymatous lesions, i. e., general paresis and tabes, in which the parasite is located between the individual neurons.

It is certain that salvarsanized serum injected into the subarachnoid space of the theca has resulted in the improvement of many cases of tabes; it is also certain that this same injection in paresis is much less efficacious.

Is it not fair to hope that the injection of salvarsanized serum into the subarachnoid spaces of the brain may result in improvement? The essential points are that the serum should circulate in the perineuronic spaces of the brain where the spirochaetes reside; that more serum can be gotten into these spaces by the intraventricular method than by any other.

The preclinical stage of syphilitic brain disease is the ideal time for this treatment; when the brain cells have been destroyed, it is too late. Clinical experience offers many examples of the course of the stream of the cerebro spinal fluid. For example, in fulminating subarachnoid meningitis, spreading from infection of the base upwards over the cortex, the pus fills up the sulci between the convolutions and soaks into the gray matter of the cortex along the sheaths of the pial vessels. This is the course that it is desired the salvarsanized serum should take when mingled with the cerebro spinal fluid. In this way the serum must reach the perineuronic spaces of the cortex, especially in the neighborhood of the Sylvian and Rolandic rivulets. Thus it appears clear that the serum introduced into the ventricles does reach the anchorage of the spirochaetes.

It is suggested that the same method might be employed to arrest tabetic nerve atrophy. The optic nerve has a sheath of the dura, arachnoid and pia. The spaces beneath these membranes can be separately injected. The injection beneath the arachnoid passes into the substance of the optic nerve. If beneath the pia, it passes into the optic nerve and extends as far as the papilla. This should be the path which the curative serum should travel so far as to save the essential elements of the papilla and retina from destruction. Whether the injection should be made into the ventricle or through the outer angle of the sphenoid fissure into the subarachnoid space at the base of the brain remains to be determined.

Schoenberg made a collective investigation regarding current treatment of syphilitic optic nerve atrophies by American ophthalmologists. The majority were unfavorably inclined toward the intravenous administration of salvarsan. The spinal treatment had not been given a trial by most ophthalmologists. The statement of those who used the latter without beneficial results cannot be accepted as first class evidence because we are not furnished with results regarding the condition of the patients and how systematically the treatment was carried out. An arrest of the process causing the failing vision or an improvement should be expected only after a systematic course of six to twelve or more spinal treatments combined with persistent antiluetic treatment.

Many ophthalmologists are of the opinion that salvarsan acts injuriously upon the optic nerves which are in process of atrophy; others believe, on the contrary that it is more injurious in non-luetic atrophies; still others think that salvarsan may cause atrophy in intact optic nerves. Some think that the drug is only beneficial in incipient cases of optic atrophies.

Some consider the spinal treatment as a dangerous procedure. Some have based their doubts on the value of salvarsan in optic atrophies upon the supposition that the drug is a spirachetecide, and not an antidegenerative. This objection may be correct; in addition to being a spirachetecide, the drug may be a tissue stimulant as well. A few colleagues brought up the question as to how much we should fear a Hersheimer reaction while treating lues of the optic nerves. One thought latent sinusitis might be lighted up by the treatment—a sort of Hersheimer reaction in the nasal sinuses.

It is correct to have the patient examined by a trained neurologist, because these patients have syphilis of the central nervous system, most of the time. It is probably advisable to put the patient in the hands of an expert syphilographer. It is unfortunate, however, to throw him over altogether; this should not be done. The patient should be kept under the observation of the ophthalmologist.

Schoenberg says if the general practitioner would properly treat patients with syphilis of the nervous system they would less often have blindness. Ten to 15 per cent of tabetic, and 4 per cent of paretic patients develop optic atrophy. Of 100 cases of brain syphilis, 40 per cent show involvement of the optic nerves. The general practitioner can prevent involvement of the nervous system by early efficient treatment. The neurologist and ophthalmologist are unable to help much, as they see the cases too late. The nervous system is invaded in one out of four or five cases, which invasion takes place usually in the secondary stage. Hence the time to prevent this invasion is in the secondary stage, when the patient is in the hands of a general practitioner. By examination of the pupils, use of the ophthalmoscope, measurement of the acuity and fields of vision and examination for diplopia, early invasion of the central nervous system and optic pathways may be diagnosticated. Beginning rigidity of the pupils to light or accommodation; involvement of the optic nerve as shown by fields, or a diplopia may show very early. Edema or inflammation of the optic nerves may be present without involvement of the vision.

Some of the types of syphilitic atrophy terminate rapidly in blindness; these are usually in old infections. Others have a slow course. When the central vision begins to fail before the case is seen, treatment is often of no avail. When the failing vision is due to a physiological blocking of the optic nerve fibres, or to inflammatory infiltrate and exudate, treatment will frequently cause an improvement in vision. Spinal therapy offers us better results than general treatment.

Results are good, if the cases of syphilitic optic nerve lesions are treated early, during the secondary stage of the lues; they are not very bad, if properly treated in the tertiary stage; but very poor in the atrophic stage of an old process. The optic nerves should be watched throughout life in a luetic person.

In an elaborate paper on the treatment of tabetic optic nerve atrophy **Behr** reports illustrative cases, and points out that disturbance of dark adaptation is the first symptom of this form of optic nerve degeneration. It is a symptom that is directly relieved by antisyphilitic treatment. But he finds there are three types of cases in which energetic antisyphilitic treatment is contraindicted. The first is impairment of central vision with early loss of color sense, but normal fields for white. 2. Extreme concentric contraction of white and color fields with normal or almost normal visual acuity. 3. Slight disturbances of the color field affecting white more than colors, normal or almost normal vision with pronounced ophthalmoscopic evidences of atrophy and strong subjective light phenomena. In all other cases the specific treatment of the optic nerve process should be as energetic and long continued as possible.

Drusen of Optic Nerve Head.—In a patient shown by **Boyd,** a man aged 54, both optic discs were covered with glistening masses of the kind commonly known as drusen. The patient's vision was entirely normal.

Visual Tracts and Centers

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This section of the Digest carries the literature from June, 1919, to July, 1920. For previous references see A. J. O., October, 1919, p. 185.

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DIGEST OF THE LITERATURE

Anatomic Relations of Chiasm.—**Fisher** exhibited by means of the epidiascope, a life sized drawing through the center of the optic chiasm to show the pedicle of the pituitary body and the intimate relationship between the lateral boundary of the pituitary body and the inner wall and internal carotid artery. This artery having come forward in the floor of the cavernous sinus makes a bend with its convexity forward as it ascends to pass in the mesial side of the clinoid process on its inner aspect. It also showed the ophthalmic artery coming off. Fisher considered that if there were a swelling of the pituitary body, either transient or permanent, it is likely to cause an immediate effect on the carotid artery by indenting its inner wall and so interfering with the blood flow, and producing thereby an effect on the cerebral and possibly on the retinal circulation.

Neurobiotaxis.—A brief chapter in the history of the evolution of the nervous system appears in **Kappers'** study of the phenomena of neurobiotaxis as demonstrated by the position of the motor nuclei of the oblongata. His studies are in line with those of Bok which have been made familiar under his term "stimulogenous fibrillation" of the axones in the study of development through functional impetus. Kapper states "we find the interesting fact that the laws which determine the material arrangements in nervous systems are strictly homologous to the laws of psychology." (O. Y. B. v. 15, p. 187, A. J. O., Oct., 1919).

Anatomy of Centers—Morax discusses the theories of the cortical connection of macular fibres and comes to the following conclusions:

The periphery of the retina of each eye is divided into two halves by a vertical line, and each of these halves is connected with a corresponding center in the occipital lobe. The macular region of each eye is divided into two halves, each of which is connected with a corresponding occipital visual center.

The occipital visual center for peripheral vision is not the same as that for macular vision, the latter seeming to be nearer the median line, at the posterior extremities of the occipital lobes.

Occipital lesions may affect the peripheral and macular centers separately or simultaneously. From combinations of these result the different macular and peripheral hemianopic types so frequently seen during the war. Preservation of normal visual acuity is compatible with destruction of one of the macular visual centers. Destruction of both macular centers results in central scotoma; when combined with destruction of the peripheral centers, complete blindness results.

Van der Hoeve has written on the significance of the field of vision in relation to the distribution of nerve fibres in the retina.

Physiology.—Zeemann and Roelofs showed that if different shades of gray are offered to each eye, one receives an impression between these non-ocular impressions; but if the difference is very great such a combination is not always possible, and it can come to suppression of one image, or to alternating suppression, or the struggle of the visual fields. The course of these oscillations was registered with the kymographion, which showed that the share of each eye was about alike when the eyes were equal; that with one-sided diminution of contrast the share of one eye would be diminished. This was also studied in the peripheral field.

The influence of the ocular movements was more striking, and should mostly be explained by changes in distinctness of images and contrast caused by these motions. These investigations also led to important data regarding the attention. This struggle registration in anisometropes demonstrates the different parts in either eye in observation, and the influence of the correction. It is easier to understand therefore why a one-sided amblyopia is often found with hyperopia and very rarely with myopia. A more detailed account of these observations will be published later.

Diagnosis.—During the selective service examinations so many applicants were referred to the Medical Advisory Boards for reports involving the visual fields it seemed imperative to **Beach** to devise some apparatus for this test more rapid than the regulation perimeters, which would also do the work completely and accurately. With this idea a black board was bent on the segment of a concave cylinder, axis 90 degrees, changing the lower half of the instrument to the segment of a sphere. In other words it is a scoop with the mouth up.

The cylinder has no overhanging lip, so that a light from above and behind meets no obstacle to prevent it from illuminating the entire working surface. The illumination has been further improved by cutting away all the outer part of the hemisphere beyond the limit of the normal field. A separate scoop is needed for each eye. The head-rest loops above the eye resting above the brow instead of underneath on the cheek. It can be either washed or boiled. Any suitable material can be used in making the scoop. Those now in use are constructed of paper laminated over a core, which is removed when the paper is dry. On the inside is painted a black surface. Eight diameters are indicated, also circles of ten degrees each and the blind spot, all outlined with faint white lines. The scoop permits a complete field examination as quickly as the ordinary ophthalmoscopic examination, so that it can be performed as a routine measure in the office.

Kikita has written on the fields of vision and their impairments; **Marx** upon the limits of the visual field and **Mendel** and **Potzl** on hemianopsia. A paper has been published by **Wertheim-Salomonson** on binasal hemianopsia and one by **Weve** on complete puerperal hemianopsia.

Burden reports the results of an investigation undertaken to account for the various difficulties that occur in the use of Roentgen rays stereoscopically, and to find a means of overcoming them.

Sound and Color.—Taking up the association of certain sounds with particular color impressions, **Ribon** discusses the topography and physiology of the brain center or centers which allow the perception of impressions transmitted by the optic and auditory nerves. He expatiates on the close connection between these nerves in this respect, and on the way in which music often takes advantage of this fact to give an impression of actual color. The range of the wood-wind instruments represents one color, other instruments other scenes and colors. The flutes and horns in the introduction of Haydn's "Creation," for example, reproduce the fresh coloring of the morning.

Psychology of Vision.—By means of examinations and experiments for determining the reading and number asthenia of school children, the following conclusions were reached by **Rauschberg**:

1. The reading ability and efficiency is the result of the development of a special center at a certain age in the child's life. Children of the same age and the same grade of intelligence show a great difference in the ability to read.

2. This ability, evidently the result of a special development of the nervous system, shows in general a relation to the school age of the child. Some children show a rapid development of their ability quickly developing into efficiency, while others are retarded in this throughout their school life.

3. Within the limits of normality there are several well defined grades of reading ability. The best pupils are good readers, the medium pupils fair readers, and the poor pupils poor readers.

4. Children who have asthenia for reading are hindered in all their work so that they make poor pupils.

5. Asthenia between 6 and 10 years is common, but between 7 and 8 years it must be considered a normal phenomenon.

6. The wide natural difference in normal children suggests that in large groups of children there should be standardization of the work for different grades of intelligence.

7. Individual instruction is helpful in cases where other methods fail.

8. Normal children conquer their asthenia in the following percentage: Ninety per cent between eight and nine years; abnormal children in the following percentages: 9 to 10 years, 6 per cent; 11 years, 6.7 per cent; 12 to 14 years, 25.7 per cent.

Kuile has discussed the kinematoscopy of a moving point, and **Filehne** the visual perception of size on the earth and in the sky.

To improve the vision of hemianopics, **Igersheimer** used a mirror arrangement which was attached to the spectacles. Objects on the blind side were thereby reflected on the seeing half of the retina. Correct localization of the image in the mirror is soon learned.

Space Perception.—A general paper on the psychology of vision has been published by **Ferree** and **Rand**. In a lecture on "Disturbances of Visual Space Perception" **Holmes** first describes the normal physiologic processes of space perception, and then points out in detail the symptoms observed in eight men with gunshot injuries of the brain who had disturbances of space orientation. The disturbances could not be attributed to blindness or amblyopia, as the acuity of central vision was good in all the patients. The symptoms were also unconnected with paralysis and loss of sensation, and there was no serious degree of mental deterioration.

The most obvious symptom was the inability to determine the position in space in relation to themselves, of objects which they saw distinctly. Neither could they recognize the spacial relations to themselves of objects which they saw, nor could they give accurately the relative position of two objects that were at the same time in vision. The absolute and relative lengths and sizes of objects could not be estimated. Stereoscopic vision was also seriously affected.

The wounds involved the posterior and upper parts of both parietal lobes. The post-mortem examinations of two of these cases showed involvement of the angular supramarginal gyri, while the missiles passed through the mesial surfaces immediately dorsal or posterior to the splenium of the corpus callosum.

Commenting on this condition **Sym** points out that the visual symptoms fall into two groups; inability to direct the eyes in a required direction, and disturbance in localization of vision. It was significant too that in all these cases both hemispheres of the brain were wounded.

Two cases with disturbances of space sense in circumscribed disease of the optic radiations of Gratiolet are reported by **Mann**. One case came to necropsy and multiple metastatic carcinoma of both hemispheres was found. The author's theory is that paropsia is a para-function of the retina, in an attempt to compensate for disturbance of the centers, in which false impressions of the perspective of the surroundings are received. This, he believes, is the result of a pure perceptive disturbance and not the well-known associative disturbance of the optical central apparatus.

Schilder reported two cases of illusionary perception in blind persons.

Congenital Word Blindness.—A case of congenital word blindness came under **Bluemel's** observation. The patient was a boy 10 years of age. He could not recognize printed or written words and had visual verbal amnesia. The mother of the boy had a strongly positive Wassermann, and the author believes that congenital syphilis is responsible for the defect.

Wolff exhibited a case of congenital word blindness in an imbecile soldier. The author believed that the patient's mental condition and a congenital visual error were partly responsible for the defect.

A case of congenital word blindness was reported by **Heine.** The author isolated the reading center in the lower parietal lobe, posterior to the upper temporal lobe or the gyrus angularis of the left side, as being defective. His conclusion with regard to such cases in general is that such a defect is solitary, and does not affect the general intelligence. In all the cases which he reviews only one occurred in an idiot, and this case was not clearly defined. He attributes the etiology of the defect to the fact that in some people the visual mind image is not transposed in the cortical centers as easily as in others.

Mirror Writing.—In a monograph on mirror writing, **Beeley** reports that in 103 Chicago schools responding to questionnaire sent out on this subject, 42 cases of tendency to mirror writing were found. They were all left handed. Only nine were reported as mentally deficient or troubled with nervousness or defects of speech. Beeley believes that mirror writing has primarily nothing to do with idiocy, although other investigators declare that this anomaly is positively correlated with mental deficiency. Beeley gives methods of correction to be applied to children, and advises careful supervision of left-handed pupils to prevent the formation of a wrong habit of writing that might be difficult to overcome.

Functional or Transient Blindness.—

Two cases of complete transitory blindness were observed by **Sgrosso** in soldiers who had traveled over 3,000 meters in the snow. Headache developed followed by complete blindness the next morning. Examination revealed slight increase of caliber of the vessels. Both patients suffered from fever and lingual inflammation, with intestinal intoxication, while in the second in addition there seemed to be retinal anesthesia. Without doubt these symptoms were greatly aggravated by great physical fatigue from the long walk in the snow. Both patients recovered after seven days with normal vision.

A case of transient homonymous hemianopsia following grippe was reported by **Tuto**. When first seen by the author the patient had a homonymous hemianopsia which did not involve the macular region. A month later the fields for form had almost fully returned. Two months later the form fields were normal, but a hemianopsia for colors still remained in the nasal field of the right eye and slight contraction of the color fields were present in the left. The vision when last seen by the author was R. 0.6, L. 1.0. Ophthalmoscopic examination revealed normal fundi. The author believes that the lesion was of cerebral origin.

Amblyopia following influenza occurred in two cases reported by **Frias Onate**. The patients were both adults who noticed blurring of vision in a few days after the influenzal attack. The ophthalmoscope showed no indication of intraocular lesion. Treatment was directed to overcome intestinal autointoxication, and vision was soon restored.

A case of psychic blindness with right lateral hemianopsia in a woman 61 years of age is reported by **Veasey**. The patient had rheumatoid arthritis and valvular heart disease for a long time. She stated that she became suddenly blind in both eyes.

When examined on the following day both pupils were 3½ mm. in size, but did not react to light, although they did to accommodation and convergence. Movements of the eyeballs were normal in all directions, and the ophthalmoscope showed no fundus changes. There was present right homonymous hemianopsia, the line between the blind and the preserved field passing down the median line, the fixation point remaining in the preserved half. The patient could distinctly see all objects in the preserved visual field, but was unable to name any object from vision alone, but could do so just as soon as the object was touched.

Twenty-four hours later the visual sense was found to be returning, as the patient could recognize many objects from sight as well as from touch, but the pupillary reaction to light was still absent. Three days later the visual acuity and the visual fields were entirely restored, the pupils reacted somewhat sluggishly to candle light and rapidly to daylight.

Three cases of transient unilateral amaurosis in men around 50 years of age were reported by **Ferro**. Amaurosis with brain tumor is the subject of a paper by **Brutsaert**.

Ophthalmic Migraine. — During a practice of nearly fifty years **Spalding** states that he has never come across a case of scintillating scotoma as described in the various text books. For the benefit of his fellow oculists he describes two forms of this condition which have occurred in himself, appearing in his right eye, which differ considerably from the classical descriptions of this condition. The sight in his left eye was damaged by an injury when he was a boy. The refraction of the right eye has undergone change with development of astigmatism, the angle of which has shifted slightly.

In one form of scotoma coming on when facing a bright light there are the fortification margins with a greenish oval-shaped center; in the other form which develops when going into a dark place after having been in a bright light the scotoma is kidney-shaped with a rose-colored center. The scotoma is not accompanied by migraine, it lasts but a few minutes, leaving the vision totally unimpaired.

Hensen presented an additional case of migraine associated with pulsation, headache and vomiting. The attack for which the patient sought relief lasted a week, and vision became so poor that she had to be led. It was associated with a small scotoma like bilateral right-sided hemianopsia, which persisted after the attack. He thought the lesion was in the posterior peduncle of the inner capsule. He reviews previous cases, and while offering no new thought as to its etiology, yet leans toward the theory that migraine is due to a cramping or embolism of the cranial vessels, rather than an intoxication or autointoxication. He thinks that scotomas and hemianopsias resulting from such attacks are largely functional, because there is rarely a demonstrable lesion in the optic nerve or centers. A partial scotoma, or a relative one for colors, would speak for a pressure embolism in some cranial vessel.

Pagenstecher has written upon scintillating scotoma.

Inhibition of Vision.—A case of psychic blindness came under **Moreau's** observation. The patient, a soldier, 36 years of age, suddenly became blind after the prolonged strain of bombardment. The next day his vision was normal. During another bombardment the patient complained of severe occipital headache followed by blindness. When first seen by the author, two days after the onset of the condition, the vision was reduced to seeing fingers at R. 0.5, L. 1.5 meters. The right pupil was larger than the left, but otherwise the eyes were normal in every respect. The patient regained normal vision in one month. The author believes that the most logical explanation for the cause of the symptoms is some vaso-motor phenomena. **Binswanger** demonstrated a case of psychogenic amaurosis.

In an exhaustive paper on the ocular phenomena of the psychoneuroses of warfare, **de Schweinitz** cites many cases coming under his observation exhibiting the various psychologic disturbances such as amblyopia, achromatopsia, dyschromatopsia, etc., all of which may be part of the symptom group in what has been known as "shell shock." It is evident as he points out, that these war neuroses do not differ from the peace neuroses in their symptoms and evolution except in the association of the war coloring. A paper on hysteric blindness has been published by **Salterain.**

Two cases of contraction of the visual fields, which were not associated with a hysteria, were reported by **Fradkine.** The first patient was a soldier who was found to be a malingerer. The condition was detected by confusion tests. In the second case there was marked contraction of the visual fields which followed grippe which left the patient in a run-down physical state. The patient had word blindness and symptoms of retinal asthenopia. There were other physical signs of cerebral disturbance. The author classified the condition as an aborted meningeal state. Fradkine concludes that contraction of the visual fields without demonstrable changes in the eye are not necessarily of hysteric origin, but frequently are due to some general systemic condition, which should always be sought for when this condition is encountered.

From his observations in a large number of cases during the war **Hurst** bases his new conception of hysteria. He defines this as a condition in which symptoms are present which have been produced by suggestion, and are curable by psychotherapy. This definition differs from all others in not recognizing an hysterical condition apart from the presence of definite hysterical symptoms. He cites cases of homonymous hemianopsia commonly regarded as organic, persistent headache, amnesia, and fits developing after head injuries, although the recovery with psychotherapy proved that they were hysterical. **Teal** reports three cases of hysterical amblyopia.

Lesions of the Optic Chiasm and Hypophysis Disturbances.—A case of pituitary disease in a woman was presented by **Eigler.** Three months previously she had pain in the left eye and forehead when doing close work, and said her sight began to fail in the left eye at that time. At the present time her vision 5/60 raised to 5/20 with correction. The field of vision was very narrow, retained above and to the temporal side only. On the nasal side and below there was no vision. Vision in the right eye was normal.

Pituitary Tumor.—Ormond showed a case of pituitary tumor. Skiagraph showed the sella turcica much enlarged, so that the body of the sphenoid seemed to be eroded away. The visual fields were atypical, as the hemianopsia was more on the nasal than on the temporal side. Cargill, in discussion, also showed a case of pituitary tumor in a man of 22, who looked 16. He had left temporal hemianopsia and contraction of the right field. Both discs were pale, and there was considerable enlargement of the pituitary fossa.

Hirsch operated on fifty-nine cases for hypophyseal tumor. The eye symptoms were all confirmed by the operative findings. Disturbances in direct vision were present in all cases without acromegaly. It varied from a weakening of vision in one eye to nearly total blindness in both eyes. In the series the findings were as follows: 1. Temporal hemianopsia, 84 per cent. 2. Homonymous hemianopsia, 7 per cent. 3. Loss of nasal half of the field in one eye, 4 per cent. 4. Central scotoma in 11 per cent in the beginning of the disease. 5. Uncharacteristic disturbances of the field, 7 per cent.

In this author's series atrophy of the optic nerve occurred in 91 per cent of the cases; muscle paralysis of eyes, 7 per cent, and nystagmus, 7 per cent. In 22 cases with acromegaly, 55 per cent had no visual disturbances. This is explained by the intrasellar position of the hypophyseal tumor.

A case of pituitary tumor was reported by **Mayou.** When first seen the vision was R. 6/24, L. 6/60, with full fields for hand movements. In three months the vision had dropped to R. light perception, L. 6/60. Left field showed a temporal hemianopsia and both discs were atrophic. X-rays revealed great increase in the size of the sella turcica.

The paper of **Jorge** and **Natale** reports six cases of tumor of the hypophysis. The first in a man of 37 years with atrophy of both optic discs and a negative family history, exhibited the Fröhlich syndrome and the X-ray showed destruction of the sella turcica. Both fields of vision were slightly contracted concentrically; in the right there was an almost quadrant defect below and to the nasal side, while nearly the lower half of the left field had been lost. The region of the sella was reached by the operation of Hirsch after a preliminary turbinectomy. The portion of tumor removed was pronounced typical glioma. After operation the field of the right eye improved somewhat; that of the left remaining about the same. Central vision was not materially changed.

The second case occurred in a man of 28, who also presented the Fröhlich syndrome. Vision in the right eye was reduced to 1/10, while the left was entirely blind. The right eye presented a temporal hemianopsia with slight contraction of the nasal field. A portion of this tumor also removed by endonasal operation was pronounced glioma. Following operation the field of vision of the right eye notably enlarged, reaching almost 40 degrees in the temporal field a little below the horizontal. The left eye remained blind.

Case 3 was of a woman, aged 42, with vision R. counting fingers at 1 meter; L. 2/3. Atrophy of the right nerve, and slight neuritis in the left. The periphery of her field of vision was perfect, but there were central bitemporal scotomata, extending nearly 10 degrees above and below the fixation point and 5 degrees to the temporal side.

Case 4 was of a woman, aged 32. R. absolutely blind, L. vision of 1/3; temporal hemianopsia.

Case 5 was of a woman, aged 31. L. entirely blind, R. vision of 2/3; complete temporal hemianopsia with some loss of lower nasal field. Radiographs showed a tumor encroaching on the region of the hypophysis.

Case 6 was of a man, aged 20, suffering from syphilitic disease of the region of the hypophysis. There was optic atrophy and impairment of the field of vision. Specific treatment giving no relief, the Hirsch operation was done. No improvement in the visual condition was obtained.

Raulston has also written upon tumor of the hypophysis.

Ford showed a case of what she regarded as pituitary tumor, although she was unable to find signs of disturbances of pituitary secretion. There was, however, marked contraction of the fields, left homonymous hemianopsia and a scotoma in the right field of the right eye. Skiagraphically the sella turcica appeared to be normal.

Schlivek presented a patient in whom the X-ray showed the presence of a tumor in the pituitary body. This 8-year-old girl had suffered from frequent severe headaches often accompanied by vomiting. Three years previously the left eye became prominent, and a year ago was found to be blind. The family history was negative. Vision in the right eye was 20/200; in the left eye no light perception. The right fundus showed simple optic atrophy. In the left the nerve head was white with ill-defined margins and was elevated 1.5 D. The right eye had a temporal hemianopsia. X-ray showed enlargement of the right optic foramen and a very large sella. The general contour and pushing back of the posterior clinoids gave undoubted evidence of a pituitary tumor, and from the invasion of the left orbit it was probably a sarcoma.

Baute reports a case of double partial atrophy of the optic nerves in a patient with the adiposo-genital syndrome and showing bony lesions of the base of the skull in the region of the hypophysis, with reproduction of the X-ray plate and field of vision and an extensive bibliography. Examination of the eyes showed an atrophic pallor of the discs, with no signs of retinitis or neuritis. She had always suffered from anemia, palpitation of the heart and syncope. In 1915 her sight began to fail, first in the left and then in the right. Examination showed a general adiposity, weight about 168½ pounds. Radiography showed malformation of the base of the skull, with complete disappearance of the sella. The visual fields showed on the right a contraction with a superior temporal defect. The left showed a concentric contraction. Perception of light preserved in the deficient parts of the fields. The right eye was able to recognize only blue of the colors, and then in a very uncertain manner. The left recognized the colors well, but their fields were contracted. A general discussion of tumors of the hypophysis follows.

A case of pituitary struma was presented by **Tyson**, which had recurred two years after a partial enucleation of the growth, with the symptoms of increasingly poor vision in the right eye, and the visual fields indicating a pressure on the chiasm. Cushing had partially removed the growth, which he described as a soft, reddish mass protruding between the legs of the chiasm. He removed a portion about 2 cm. in diameter. Previous to the operation vision was R. l. p., L. 20/50 with bitemporal hemiachromatopsia. Six weeks after the operation vision was R. 20/30, L. 20/15, and visual fields practically normal.

One month later vision in the left eye began to fail and he had occasional headaches over the left eye. Six months later the X-ray indicated some osseous malformation rather than pressure from a soft tumor. Four months later vision had diminished to R. 20/500; L. 6/20 with bitemporal hemiachromatopsia, and contraction for all colors in the nasal field also. The interesting feature was the return of the pressure symptoms after a lapse of two years. The patient was about to have another operation.

Whale reports the case of a woman in whom there was great improvement of pressure symptoms following the operation of sellar decompression and removal of epitheliomatous tissue from the anterior lobe of the pituitary gland. Some time before the operation the vision was R. 6/24, L. 6/60. The fields showed deficiency in the temporal halves to the fixation point. Vision diminished to light perception only shortly before the operation. She had persistent severe headaches. Skiagram showed a large pituitary fossa.

The operation was done through a modified Moure's incision. A collapsed cyst about the size of a cherry was removed. About five weeks after the operation vision had improved to 6/9 and 6/18, there was considerable restoration of the visual field and her general health had improved in every way.

Dameno relates that a boy of 10 had presented symptoms of diabetes insipidus for four years, and during the last year there were transient attacks of amblyopia and progressive reduction of visual acuity to 1/50 in the left eye and light perception in the right. The sella turcica was somewhat enlarged, but seemed of normal structure. As inherited syphilis was manifest, specific treatment was pushed and marked improvement followed, but it did not last and the child died after a period of intense headaches, neuralgia and loss of vision. The symptoms corresponded to a lesion in the vicinity of the optic chiasm. It is probable that in this case some syphilitic process had induced diffuse infiltration involving the optic chiasm and the pituitary body.

Lesions of the Basal Tracts and Ganglia.—Three cases of alterations of the ventriculo-chiasmal region in cases of cerebral tumors with choked disc were studied by **Bollack.**

In the first case, a recent one, infiltration of the subependymal neuroglia and lacunar disassociation of the nerve fibres in its vicinity were noted. In the second case, one of longer standing, there was in addition some discrete perifascicular infiltration at the origin of the optic nerve, most pronounced in its orbital portion. In the third case, there were the same lesions of the neuroglia. One nerve, showing choked disc, was affected by an intrafascicular lacunar disassociation. The other, which was atrophic, following an old enucleation, showed perifascicular infiltration. These lesions would tend to show the propagation of ventricular tension directly to the optic nerves through the mediation of the neuroglia and nervous tissue of the chiasm, manifesting itself in choked disc. Three illustrations accompany the article.

Perthes successfully removed a tumor of the choroidal plexus which was diagnosed entirely from the eye findings. There was bilateral choked disc, severe paling of the left macula. A homonymous right-sided hemianopsia was present. The symptoms subsided very quickly after removal of the tumor.

A case of bitemporal hemianopsia following war wound was added to the literature by **Bollack.** The patient was wounded in the right parietal region, with a fracture in this location. Symptoms present were loss of memory, difficulty in speaking, loss of vision of left eye with dilatation of pupil, vision of right eye 2/3, paralysis of right abducens and left motor oculi complete, and optic atrophy left side. The vision on left side increased to 1/100, and the perimetric measurement showed a bitemporal hemianopsia involving the fixation point on the left, but not on the right side. Peripherally, especially on the left side, there was some concentric contraction.

Radiographs showed loss of cranial substance in right parietal region and a kind of effacement of the posterior part of the sella, in the region of posterior clinoid processes, with enlargement of the antero-posterior diameter. No hypophyseal changes. The author thinks the fracture extended into the base of the skull involving the apex of pyramid (VI nerve), the posterior clinoid process, and finally the optic canal in the sphenoid. A table of eighteen cases, including his own, is given, with the symptoms present, and a comparison of the cases.

Fleming and **Busy** report a case of hydatid cyst of the brain which is rare and extremely difficult of diagnosis. There was an acute double optic neuritis with much swelling of the papillae, hemorrhages and exudates around the disc, incomplete alexia and loss of memory, central color sense normal, complete right homonymous hemianopsia; refraction practically emmetropic. The pupils were unequal, both contracting to light, accommodation and consensually. There was a fine lateral nystagmus. The patient died about four and one-half hours after the operation from paralysis of respiration. The post-mortem examination revealed a unilocular cyst the size of an orange in the left ventricle.

Lesions of the Optic Radiations.—A patient who had a penetrating wound of the skull was treated by **Klarfeld.** The missile entered above the left ear and came out in the right occipital region. There was a right-sided homonymous hemianopsia, conjugate squint toward the left with loss of movement in all other directions and spontaneous horizontal fine nystagmus. Clonic spasm was noted in the corrugator supercilii and levator alae nasi of both sides and in the left orbicularis oculi. All other cranial nerves were intact. The author decided that the wound to the optic tract was located back of the geniculate body.

An interesting case of homonymous hemianopsia occurring in a case of malignant malaria is reported by **Weakley.** At first supposed to be a condition of quinin amblyopia, the author states that in the treatment of thousands of cases of malaria and hundreds of thousands of men taking quinin, there has been no case of quinin amblyopia. When examined in the hospital this man's blood showed malignant malarial parasites. The fundi were both normal, but the fields of vision showed right homonymous hemianopsia, absolute and complete for colors and white. Wernicke's reaction was not determinate. His vision had previously been perfect. In considering the location of the lesion account must be taken not only of the right homonymous hemianopsia, but also the diminution of his central visual acuity, a disturbance of peripheral sensation and the loss of the localization of the limbs on the right side of his body. The symptoms suggest a lesion of the brain near the angular and supramarginal gyri and the posterior part of the internal capsule of the left side.

Two additional cases of incongruent hemianopsia after shell wounds are reported by **Meyerhof.** In one case the scotoma was the only symptom; in the other, in addition to an injury to the occipital lobe, a lesion of the base of the skull was present with auditory disturbances. The asymmetry of the hemianopic disturbance was due to an anomaly of arrangement in the fasciculi of the cortex. Two fields of vision accompany the article.

The Visual Cortex.—Only within recent years it is pointed out by **Holmes,** and as a result of many anatomic, physiologic, clinical and pathologic investigations that we have acquired any accurate information as to the region of the cortex where retinal impressions excite visual sensations. These investigations indicate that the visual centers lie within and along the lips of the posterior parts of the calcarine fissures. In most brains this striate area extends around the occipital pole on to the lateral surface of the hemisphere. Owing to the large number of cerebral injuries that have been produced by gunshot wounds, the late war has given an unequaled opportunity to discover evidence of the manner in which the different segments of the retinae are represented in the visual cortex. A number of cases are given illustrating the various ocular anomalies due to the destruction or injury of this portion of the brain.

Reis, through a series of observations and memoranda, traces the fact that homonymous hemianopsia, so crippling soon after the trauma, becomes less and less troublesome as time goes on. Gradually the afflicted person learns to accommodate himself to the condition and becomes more independent and able to go about by himself. The amount of disability following the trauma should not be judged too soon after the accident. As a rule, it is fully six months before the victims of wounds to the occipital lobe are able to begin their reconstructive education. After two or three years the total disability from homonymous hemianopsia becomes fixed.

That the age of the patient makes no difference is shown by the cases of apoplectiform hemianopsia, in which an improvement takes place after two or three years because of the adaptability of the eyes to their new condition. These patients can gradually take up a new occupation and become economically useful. However, if the hemianopsia is coincidental with disease of the brain, the patients never regain their economic independence. The functional ability of uncomplicated cases which are able to take up vocations is, left-sided hemianopsia, 33½ per cent; right-sided hemianopsia, 40 to 60 per cent.

Best summarizes his observations of hemianopsia cases from war injuries as follows: Double, 30.2 per cent; right-sided, 25.6 per cent; left-sided, 44.2 per cent; complete blindness as a result of double hemianopia was never observed. Death occurred in 12.8 per cent. One-sided hemianopia with accurate limit through the fixation point occurred once, with complete destruction of the peripheral field, but preservation of the macula in 3.5 per cent; retention of the peripheral field with complete loss of the macula, never. Paracentral double scotoma without damage to the peripheral field occurred in 3.5 per cent; double scotoma with damage to the peripheral field in 12.8 per cent; macular defect with peripheral destruction in 25.6 per cent, while in 38.4 per cent there was only peripheral defect without scotoma or macular defect.

In 18.6 per cent the pupil on the affected side was enlarged, in 7 per cent that on the opposite side. In 10.5 per cent nystagmus, in 4.7 per cent abducens paresis, in 2.3 per cent oculomotor paresis, and in one case total ophthalmoplegia were found. Incorrect optical localization regularly accompanies hemianopia. In 31.3 per cent of cases number counting by eye was defective, and in 5.8 per cent there was optical agnosis; in 25.6 per cent alexia and in 14 per cent agraphia was present.

The seat of the cerebral center for optical localization is in the calcarine area, that for the upper part of the field being situated in the lower part of the calcarine fissure, and that for the lower part of the field in the upper lip of the fissure. Alexia and agraphia seem to follow more often left-sided injury.

Fernandez reported a case of homonymous hemianopia in a man who had received an injury in the occipital region.

In a lengthy article **Monbrun** and **Gautrand** discuss the present theories of the cortical centers of vision. The authors also report cases of hemianopsia following war injuries. From experience gained during the war, they conclude that the cortical visual centers are located around the calcarine fissure; the area for peripheral vision is around the front part, and the macular area is located around the posterior portion of the fissure. The center for the upper field is below the calcarine and the lower field is located above.

A patient who was wounded by an ignition cap in the back of the head was seen by **Saenger.** There was a hernia of the brain above the occipital protuberance. The patient was completely blind and did not have light perception in either eye. The pupil reacted normally to light, convergence and emotion or sensory perceptions. The eye movements were normal in all directions, ataxia and Romberg sign were absent.

These cases are rare because the wounded person nearly always dies of meningitis or death from shock. The case proves that the sense of sight is located in the occipital lobe.

Wilson reports the case of a soldier who was struck by a bullet on the top of his head. The bone was not fractured. He did not lose consciousness, but immediately everything looked black. Ten days later his vision was normal. This was a case of temporary concussion amblyopia. In another case the bullet penetrated the man's helmet and struck the back of his head. He was rendered almost blind. The bullet had fractured his skull over a small area. After trephining an opening was found in the dura, and there was also some damage to the brain. His vision began to return in three days, and at the end of three weeks he could read with difficulty. The perimeter chart showed loss of the right halves of his fields and partial loss of the left halves. In a third case the bullet struck the back of the head on the right side of middle line. X-ray located the metal in the right occipital lobe, and it was removed. His vision was dim for three days, but it returned, but diplopia was present. This condition lasted for eight weeks. The fields showed a small scotoma for white and colors in the left halves and within the 10-degree circle.

In a fourth case where a piece of metal struck the back of the head, the X-ray showed no evidence of fracture, but the perimeter showed an area of dim vision in the vertical meridians, though no actual scotoma. He could recognize colors only within the 10-degree circle. There was some loss of peripheral vision, especially in the vertical meridians, which would harmonize with the suggestion of Gordon Holmes that the vertical axes are represented in the dorsal and ventral margins of the visual zones. The condition was probably due to concussion.

Brose calls attention to the importance of eye and ear symptoms for the proper interpretation of injuries at the base of the brain. The eye symptoms as a rule are not the result of fracture displacement, or the trauma directly, but arise through brain compression from hemorrhage, brain edema and inflammatory exudate. In other words, from indirect rather than direct injury. Papilledema is, therefore, an early and valuable diagnostic sign in many basal injuries.

During the late war many cases of hemianopsia were encountered, the result of injury to the cortical visual centers on the opposite side of the brain. Chiasmal injuries are prone to occur with fracture involving the middle fossa, while occipital injuries are more likely to produce lesions in the cortical centers. In wounds involving the occipital bone papilledema occurs more frequently than in the cranial injuries. The motor nerves of the eyes may be involved singly, collectively or in pairs. The sixth nerve is probably oftener involved than the other eye nerves. The third and the facial nerves are not infrequently injured by forceps during difficult instrumental delivery.

The vocational disability of homonymous hemianopsia is estimated by **Hird** to be from 60 to 70 per cent. The author believes that this defect is a greater handicap than the loss of one eye. When the hemianopsia is complicated with the various types of alexia, the author believes that the disability should be estimated at 100 per cent.

The disturbance of the center of vision by gunshot wounds is the subject of a paper by **Fuchs** and **Potzl.** **Goldstein** and **Gelb** have written on tubular fields. **Grignola** takes up the ocular troubles after cranial injuries, and **Pfeiffer** and **Poisson** have described homonymous hemianopsia after wound of the mastoid.

Color Vision

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This section of the Digest carries the literature from July, 1919, to July, 1920. Closely allied topics are found in the section on the retina pp. 153-192. For previous references, see vol. 2, 1919, A. J. O., p. 205.

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DIGEST OF THE LITERATURE

Theories of Color Perception.—In a communication to the British Association, **Lodge** suggests that light absorbed in the black pigment of the eye may stimulate certain atoms into radio activity and so cause sensation of light. **Joly** calls attention to a theory of color vision which was advanced at one time, that the emission of electrons, probably by the pigment layer, under light stimulus is responsible for light sensation; and that where these electrons act upon the cones they excite color vision. In photoelectric expulsion of electrons by light the range of the electron increases with the frequency. Hence, for violet light the cones would experience a different distribution of the stimulus from that for red light, and so on.

Sir Oliver replies that Joly's ideas are similar to his own with regard to an electric stimulation of the terminals of the optic nerve through bombardment of corpuscles flung off under the stimulation of ordinary light. This utilization of atomic energy, emitted under the stimulation of accumulated almost infinitesimal vibrations of the right frequency can account for the extreme sensitiveness of the eye and the sensitive pigments known very low down in the scale of animal life. The great varieties of brightness permissible, between wide limits, without much differential physiologic results is also natural on this view. So is the fatigue of color sensation by temporary exhaustion of specific potentially radio active material, until renewed by living tissue. The eye, therefore, can form very little estimate of absolute brightness inside these limits. A pathologic condition of the retina, when flashes are perceived without objective stimulus, may be accounted for by over instability of material, and consequent spontaneous emission of corpuscles.

In response to the above, **Allen** declares that such a theory of color vision was advanced by him in a lecture before the Roentgen Society in January, 1919. In his opinion it is unnecessary to assume that a photochemical change is the cause of the visual sensation, for it appears to him sufficient to suppose that photoelectric action takes place in the rods and cones so that we have a separation of electrons resulting in electrification of the nerve cells which set up the nervous impulse to the sensorium. The peaked curve, which shows the relation between the sensitiveness of the eye for light and different wave lengths, bears a very close resemblance to the wave which shows the variation of photoelectric activity with wave lengths.

Gjessing has written on color perception in color blindness.

In a compact form **Edridge-Green** publishes the result of his researches in vision and color vision in the past thirty years. He presents the subjects in the aspect of the facts as more recently developed, which are, therefore, available for explanation on any theory. The first part of the book is devoted to a general consideration of the physiology of vision, while the second part deals with color vision, in which is discussed such subjects as methods of examination of the color sense, hexachromic and heptachromic vision, color blindness, the evolution of color sense, etc., etc. In the final chapter the author presents his theory of color vision and his objections to other theories. At the end of the chapters the important points are summarized. Dr. Green insists that experiments in color vision need quite as much care and rigorous definition of conditions as those in any other branch of science. He has all along pointed out that the results of experiments may be vitiated by imperfect apparatus. In this work he describes his own inventions and explains the theories he has put forward and his grounds for rejecting the results of former experiments.

Color Sense in the Lower Animals.—The sense organs of fishes are but feebly developed in comparison to the sensory specialization of land vertebrates. The question of their color perception has been a matter of considerable dispute, but evidence concerning it has been accumulating in the past decade. **White,** in 1914 and 1915, conducted an elaborate series of experiments to determine the ability of mudminnows and sticklebacks to discriminate colors. Her conclusions, based upon her own and others' investigations, are interesting.

She believes that some species of fishes perceive differences in colors and that their discrimination is based upon the wave-lengths of the light and not on the intensity. It seems rather unlikely that the color vision of fishes approximates that of human beings. It would be of interest to know to what range of colors fishes react. The stickleback, at least, seems to be unable to discriminate between blue ($420\ \mu\mu$ to $480\ \mu\mu$) and yellow ($580\ \mu\mu$ to $630\ \mu\mu$) ($660\ \mu\mu$ to $710\ \mu\mu$). Mud minnows were able to discriminate between different wave-lengths of light in reds, greens, blues and yellows as shown by associations of papers and food with these colored lights. In their search for food, the perception of color and movement seem to be of greater importance than patterns and differences of backgrounds.

The results of the experience of White with sticklebacks give little support to the duplicity theory of **von Kries,** but might be explained upon the basis of Hering's theory of opponent colors, if it is assumed that the yellow-blue substance is lacking. The conclusions seem to accord with the Young-Helmholtz theory if it is supposed that the eye of sticklebacks has none of the blue component.

Using the ordinary wild birds such as the swallow for experiments, **Hahn** found that their color sense was nearly as highly developed as in man. The author believes that the experiments carried out by v. Hess were faulty because they were made in surroundings which were strange to the birds.

The author concludes that the short-waved rays of the spectrum are not judged by their light worth, but by their color value. In tamed birds of the same species the color sense was more acute.

Hahn believes that the relation of the oil globules in the cones of the birds to color sense is problematical.

Hess believes that bees are color blind, since they are unable to distinguish yellow and blue from each other or from a gray when these are of equal luminosity for the color-blind human eye. He consequently disputes the results put forth by zoölogists to prove that bees can be trained to distinguish colors, and is not convinced by the impressive demonstrations of von Frische, at the Congress of zoölogists in Freiburg, in 1914, as no control of grey trained bees was added to the blue trained bees. **Buttel-Reppen** has written on "Are Bees Color Blind?"

Heredity of Color Blindness.—The record of a color-blind family, published in the Philosophical Transactions of the Royal Society of London for 1779, which was communicated by the Rev. Michael Lort, is analyzed by **Cole**. The communication is of interest because of its early date and because the facts as given fall so perfectly into line with the interpretation of color blindness as a sex linked character in man. It illustrates the rule that sons can inherit normal color vision only from their mothers, while daughters may inherit it from either parent or both. The family record is given in detail, and from it Cole forms the following classification of genotypes: N, for norm. vision; n for its alleomorph, and N, sex-linked. A. 1 homozygous normal females, N. N. 2. Heterozygous, normal female Nn. 3. Color-blind female, n n. B. Normal male, N; color-blind male, n. He has devised a diagram which graphically illustrates the history of color blindness as it occurred in three successive generations. The father was color blind and the defect was inherited by his son and one daughter. The mother and one daughter had perfect sight. The daughter, who was color blind, had two sons, both with imperfect sight. The son also had two children, a boy and a girl, who, like their mother, had normal color vision. **Oloff** has written on the color blindness of the new born.

Varieties of Color Blindness.—In a puzzling case of partial color blindness which **Williams** does not attempt to classify, extensive experiments were carried out with colored wools, papers, cards and glasses, and then comparisons were supplemented by careful spectral measurements. The results would place the subject whose color fields were markedly contracted in the class of the deuteranopes.

On a subject, whom **von Kries** classifies as a deuteranomalous trichromat, a number of familiar tests were made and some adaptations of old ones. The results are of interest because the defect was limited to one eye, from which we may draw conclusions as to just how colors appear to subjects of this class.

Meyer reports an exceedingly rare but typical case of color blindness in which blue and green are seen as one color, red and yellow another, the neutral zone being displaced into the yellow-green region.

Ashikaga contributes to the literature of color blindness.

Reviews of articles on color defects appearing since 1916 have been published by **Hayes** and by **Troland.**

Acquired Color Blindness.—An interesting newspaper case of a soldier who saw everything green for some time after being shot in the forehead, was published in Nature. The bullet passed out of the back of the head without killing or even stunning him.

Hilbert briefly describes a case of red vision in a girl of 8 years who was poisoned by eating the berries of the nightshade. Everything she looked at was as red as the berries she ate.

Treatment of Color Blindness.—In an anomalous trichromat, **Goldschmidt** successfully attempted by systematic exercise to increase the power of color discrimination. At first he assigned simple tasks with colored wools. Acquaintance with color names was developed by daily practice with pictures and colored objects. Actual color discrimination was increased by the use of different colored spectacles, which were worn for two hours at a time daily. His tables of results of tests at different periods in the treatment seem to show decided improvement in color discrimination. He especially recommends the treatment with colored glasses.

Tests for Color Blindness.—Hering described his color blindness apparatus, and promised to issue a set of directions for the use of the instrument. **Cowdrick** and **Winfield** have found no evidence that such instructions were ever distributed, and they are of the opinion that the reason may lie in the fact that the instrument is valueless for comparative purposes if set up in diffuse daylight; and that Hering was reluctant to commit himself to any specific source of artificial illumination available at the time when the instrument was constructed. Failing to obtain directions for the adjustment of the apparatus, they have undertaken to determine for themselves what adjustments might facilitate the performance of the tests for color blindness and also to obtain norms which might serve as guides to the ready diagnosis of types. They have devised various colored lamps for use on the instrument and have conducted a series of observations on red-green blind persons (deuteranopes-green blind, and protanopes-red blind), but they are not ready to advance their findings as of final value, owing to the fewness of their available color-blind subjects.

The correct matching of colors is of great interest from both the physical and physiological aspects of the problem, and on several occasions it has been the subject of study by the Illuminating Engineering Society. Assuming that the operator has normal color vision, he would require for his work a "white light" approaching that of the diffused north sky. Ideal natural lighting conditions are not always realizable. In winter, owing to fogs or mist, the light is too feeble in intensity or too unnatural in color to enable accurate color matching to take place. It would be a great advantage, therefore, to have some means of producing from illuminants light closely resembling that of normal daylight. It would be especially serviceable in the dye industry and in other processes in which color matching is important. Such a source would, therefore, enable color matching to be carried on independent of climatic conditions. In picture galleries "artificial daylight" would be useful in enabling the colors to be seen favorably at night. The earlier attempts at producing artificial light sought to filter out the excess of red and yellow in the illuminants by means of a colored screen before arc lamps, and later before metal filament lamps. Kenneth Mees has devised a screen of gelatine colored by fast dyes, which converts the light from an ordinary metal filament into a close approximation to daylight. This screen was found to be photographically as well as visually correct. Blue glass has been used for electric bulbs with some effect. Martin has described a method devised by Mr. Sheringham, an artist. By this a large reflector is placed above a gas-filled (half-watt) lamp the lower portion of which is obscured. The surface of the reflector is coated with a mosaic of different colored squares by which the reflected light can be made to resemble either north sky light or diffused sunlight.

Bell classifies color defects into twenty-six different types. His chief test, carried on by a spectral apparatus which he has devised, consists in matching a synthetic yellow and a synthetic blue-green of the same hues as the spectral colors corresponding to the red-yellow and blue-green junctions for the normal eyes. He shifts a pure spectrum which occupies the lower half of a slit in the focal plane of the eye-piece, while the synthetic color occupies the upper half. The synthetic color is produced by a filter made of wedges of cobalt and selenium glass. The subject matches the yellow by rotating a prism mounted on a turntable. A very slight degree of red blindness causes him to match the synthetic yellow with a green, while a plus red or a minus green color abnormality will produce a reddish match. Blue-green is produced by cobalt chloride in acetone solution combined with a uranin filter. In the test a green-blind will match with blue a blue-blind case with green. This blue-green junction supplements the others in the diagnosis. For further evidence of plus or minus red or blue sensation, the red and violet end points are determined, after resting the eye. Of the twenty-six possible abnormal types of congenital color vision the author found sixteen represented in his own work or in the cases reported by Abney, Edridge-Green, Burch and Watson. Seven of the remaining ten are types having two sensations plus and thus varying from a simple deficit of the remaining sensations only in the degree of luminosity of the other two. Bell suggests, as a remedial measure, the use of colored lenses to regain the proper balance of colors, as has already been done in artificial illumination to secure daylight values. An ordinary gas flame makes one partially blue-blind. The normal eye, therefore, will see colored objects under such a light very much as the blue-blind would see them in daylight. The necessary correction has been found to be the interposition of absorbing media which reduce the green and red elements in the same degree as the deficit of the blue element in the source, thus reducing greatly the luminosity. Those in whom one sensation is nearly or quite absent are, of course, beyond help, since balance would require an almost complete obscuration of the remaining sensations.

Edridge-Green's test for color blindness comprises twenty-four cards, twenty-two of which are printed in spots of one color on which is a letter formed in spots of another color. The test consists in discriminating between the colors and hence recognizing the letters. The features of the test are: 1. The construction of a diagram so arranged that there is no indication of form or tone given of any letter which is formed upon it. The shape, position and number of the spots is the same on all cards. 2. The colors on a given card are those which appear to be of the same color to the particular class of color blind which that card is designed to detect. 3. There are special cards for the detection of cases of shortening of the spectrum both at the red and the violet end, to detect inability to distinguish reds and violets from black, and also cards to detect shortening of the spectrum combined with defective differentiations. The examinee is forced to judge by color perception alone, because the only method of distinguishing the spots which form the letter is his ability to detect a different color from the other spots. Card No. 23 contains circular spots of varying sizes, and No. 24 shows the whole range in squares of color. The examinee is asked to name the color of all the squares and circles. These cards serve for a rough general testing.

The comparison of the intensity of two sources of light of the same color is not difficult, and numerous photometers are available with which good results are attained, and the observers' color sense does not necessarily affect the accuracy of the results. The discrepancy in the results of different observers depend upon unavoidable errors in the experimentations, and are largely a matter of personal equation. When the light sources are of different colors the difficulties are grave and exact comparisons well nigh impossible. A number of photometers for the estimation of heterochromic light already exist, but **Stenholm** has devised what purports to be a new method of comparison for which he claims a greater degree of accuracy than is obtainable by others when applied to lights of different colors. In principle it does not appear to differ from the familiar shadow photometer of Rumford.

Grill has written on the simultaneous contrasting of colors with abnormal trichomatic vision. **Schiötz** has published studies and tests of color perception.

Disabilities of Color Blindness.—**Barrett** reports, as a result of experiments upon himself and tests on others, that form-vision when below 6/12 is dangerous in dull light, and also because it makes small colored spots unrecognizable.

The Supreme Court of Nebraska reversed the judgment of a lower court which had decided that trainmen who, because of color blindness which debarred them from employment in the railway service, were entitled to benefits from their railway brotherhood associations, by reason of their having "complete and permanent loss of sight." The court held that one who is color blind, but whose vision in other respects is unimpaired, has not suffered "complete and permanent loss of sight" of both eyes, in the meaning and intention of the contract issued by the association. In the language of such contract "totally disabled" does not mean totally disabled from following railroad work. See v. 15, 1919, p. 331.

Color Associations.—An interesting account of the symbolism of color in religion, art, ethics and the spiritual emotions of man is given by **Evarts.**

The Eyeball

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This section carries the literature from June, 1919, to August, 1920. For previous references see A. J. O., November, 1919, p. 213.

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Lateral Proboscis, Atypical Coloboma and Posterior Lenticonus. (20 ill. Bibl.) Arch. d'Opht., March-April, 1919, pp. 463 and 555.

DIGEST OF THE LITERATURE

Colobomas of the Eyeball.—In his contribution to pathologic anatomy of congenital ocular malformations **Van Duyse** publishes minute studies and critical discussion of more common forms of coloboma. One of his cases presented the underlying conus (Fuchs' coloboma) downward coloboma of choroid and retina in the right eye and in the left eye microphthalmos with retropalpebral orbital cyst. Of the latter a detailed description is given. In the right eye after enucleation a cystic pocket 3 mm. in diameter was found at the junction of the optic nerve and sclera. Between the underlying conus and the coloboma two circular white areas were seen with the ophthalmoscope both smaller than the optic disc. With the ophthalmoscope these looked like circular atrophies of the choroid but on section showed absence of the retinal pigment layer and close attachment of the adjoining retinal layers to the choroid. At this point as at the upper limit of the coloboma there was distinct folding of the retina on itself. This study, rich in interesting histologic observations, shows the common essential nature of the defect found in the two eyes.

In the case of **Cassimatis** there was coloboma of the iris and choroid with white areas between the coloboma and the disc probably of the same character as those examined by Van Duyse. The field of vision presented an absolute scotoma corresponding with the coloboma. These lesions were confined to the left eye.

Anophthalmos.—A paper was written by **Campos** on congenital familial anophthalmos, but is not available for abstract.

Experimental Development of Anomalies.—The results of an interesting experimental study of the histogenesis of eye abnormalities in the chick embryo was published by **Ochi**. The author's technic of producing abnormalities was to inject either 0.85 per cent salt solution, distilled water, or air near the blastoderm, or to slightly stir the albumin near the blastoderm. The embryos were examined between the third and eighth day. The abnormalities found were microphthalmia, anophthalmia, acephalous, anomalies of the cerebrum, combinations of two or more of the afore-mentioned. A description of the abnormalities obtained is given.

Ochi concludes: "At the beginning of the developing of the embryo, any factor, either chemical or physical, which can disturb the normal condition of the blastoderm itself or its circumference, may bring about an abnormal differentiation of the embryo. If such disturbance of the normal condition is too great, development of the embryo may be entirely arrested. But if development is still possible some deformity of the embryo may result, especially terata of the head and abnormalities of the eye varying according to the degree of the disturbance." The reason for formation of the eye is the subject of a paper by **Fischel**.

Cyclopean Monster.—The specimen seen by **Guidote** and reported with photographs of its appearance, was that of a monster born dead. The abnormalities were confined to the head and neck, and it had been preceded by five healthy children born of the same parents. The eyeballs were fused into one, which apparently had two corneas. The orbit was oval, the eyelids in a condition of ectropion. Mouth and nasal fossa were absent. The external auditory apparatus was situated on the neck.

Lateral Proboscis.—The condition described under this title by **Van Duyse** is essentially different from the proboscis found in the median line above the eye in cases of cyclopes, or synopsia. That consists of rudimentary nasal structures. This seems to have no connection with the nose except that nasal development, especially of the ethmoid seems largely or entirely lacking on the side presenting the deformity. It is not entirely new to the literature (See O. Y. B. v. 8, p. 240). But it seems not to have claimed recognition in any systematic work on monstrosities or the larger works on ophthalmology. The appearance presented is shown in Fig. 17.

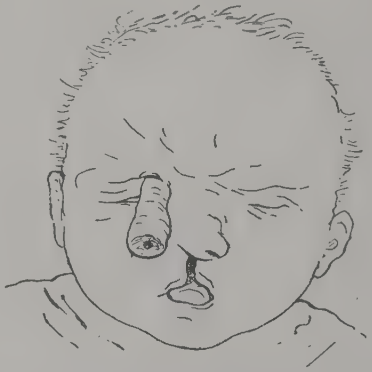

Fig. 17.—Lateral proboscis protruding from nasal portion of upper lid, in case of anomalous development. (Van Duyse.)

This child was seen when five days old and lived about two months. In addition to the projection extending from the nasal half of the right upper lid there was cranial asymmetry, aplasia of the right nose and hare lip. The general features of the case have been discussed by Van Duyse (Annales de la Soc. de Medicine de Gand, 1919). The eye conditions in addition to displacement include an oval cornea, long axis 15 or 20 degrees from the horizontal, coloboma of the iris, in the same direction toward the nose; deformity and displacement of the lens to the nasal side, absence of the suspensory ligament in that direction, coloboma of the ciliary body incomplete and also of the choroid and retina extending somewhat around the optic disc. The horizontal diameter of the eyeball was 21 mm., the cornea 10 mm.

and its shorter axis 7 mm. The lens deformity took somewhat the character of a posterior lenticonus associated with persistence of mesoblastic tissue in the fetal cleft. The location of insertions of the ocular muscles seemed not opposed to the idea that rotation of the globe of about 45 degrees accounted for the position of the atypical colobomata. From the few cases of this very rare deformity thus far reported one gets the impression that in its origin it is closely associated with meningo-encephalocele and failure in nasal development.

Panophthalmitis.—A case of panophthalmitis reported by **Shima** occurred in a child whose eyeball had been wounded by a needle. On evacuating the pus a bacillus was found of a type not previously described. The rods were long, often spindle-shaped with spores in the middle, and furnished at each extremity with flagella and were mobile. On agar it furnished small colonies having a granular surface and irregular border without liquifying the medium. These developed in the presence of oxygen and at ordinary temperatures. They were colorless, devoid of capsule and Gram negative.

A boy presented by **McKeown** had his eye penetrated by a pen knife in the hands of a school-mate, entering through the ciliary region. Pus showed a yellowish mass behind the lens and the wound was bulging. A culture from it showed normal growth of staphylococci. The verdict of colleagues who examined the case was that the eye should be removed without delay.

Metastatic Panophthalmitis.—A case of metastatic panophthalmitis due to the typhoid bacilli came under **Itoh's** care. The patient, a man 26 years of age, who suffered from gastro-intestinal typhoid noted a dimming of vision 13 days after the onset of the disease. Panophthalmitis was diagnosed. On opening the globe through the sclera pus escaped. In the pus typhoid bacilli were found.

A case of metastatic ophthalmia following la grippe was observed by **Frias Onate.** The patient, a female aged 26 years, had broncho-pneumonia complicating la grippe. When seen by the author, typical symptoms of panophthalmitis were present. Two illustrations accompany the article.

Cases of panophthalmitis arising from influenza are reported by **Samperi** and also by **Cabannes** and **Kerbrat.**

A girl four years of age with a shrunken eyeball was shown by **Eigler.** The child had pneumonia a year and a half before. During the pneumonia pain in the head over the left eye developed and the eye became soft and shrunken and blind. In discussion Black suggests metastatic choroiditis as the cause.

Evisceration of the Eye.—The operation described by **Dimitry** as supplanting enucleation is a form of exenteration of the eyeball with removal of a window of sclera at the back including the head of the optic nerve; and the implantation of a gold ball. The globe is transfixed with a Graefe knife 2 mm. back of the sclero-corneal junction and cutting out parallel thereto, making a semicircle with the knife and completing the excision of the cornea and limbus with curved scissors. The contents of the sclera are then carefully removed, a puncture made in the posterior sclera with a knife and a circle of it excised by use of the scissors. Triangular nicks are cut from the anterior margin of the sclera to make it close more neatly over the gold ball. The advantages claimed for this operation are: It inflicts little trauma and causes but slight reaction. It furnishes a filled in socket preventing sinking of the lids, and securing normal lacrimal secretion and drainage. It leaves the attachments of the recti undisturbed. The posterior window permits easy severance of the optic nerve, ready absorbtion of exudate and prevents extrusion of the gold ball. **Sondermann** has also described a modification of exenteration and enucleation.

Enucleation.—An improved method for the total enucleation of the eyeball which seeks to preserve the normal relations of the recti tendons to the capsule of Tenon has been described by **Krauss.** The conjunctiva is carefully dissected back from the cornea to the fornix. Each rectus tendon is isolated from the capsule and either half caught in a suture loop, the ends of which are subsequently carried across to the end of its opponent. The tendon is cut off; the eyeball carefully isolated within the capsule of Tenon and removed from it. The capsule is then permitted to fill with blood clot, the opposing recti tendons sutured together, and the conjunctiva closed by three sutures. The exact placing of the sutures is explained by diagrams. The advantages claimed are preservation of the full strength of the muscles, giving a movable socket with minimum retraction of the upper lid. There is little reaction and no danger of subsequent extrusion or sympathetic ophthalmia as when a foreign body is emplanted in Tenon's capsule.

The indications and contraindications for the use of local anesthesia in enucleation of the eyeball are summarized by **Hayden** as follows: Advantages, 1. Dangers of general anesthesia are eliminated. 2. No preoperative preparation is needed. 3. No assistant is necessary. 4. No danger of removing the wrong eye. Contraindications, 1. Extreme youth or highly nervous patients. 2. Purulent conjunctivitis and panophthalmitis.

In a systematic monograph of 58 pages **Marin Amat** reviews the history, indications, and technic of enucleation. He finds in his private clientele he has done 29 enucleations among 4,725 operations on the eyes in the course of 14 years. While in the provincial hospital during 7 years there were 44 enucleations among 2,532 operations. He urges that it is a measure of great humanitarian importance which is emphasized by the occurrence of industrial injuries. It is not to be done in the presence of suppuration on eyes that possess vision and with other more conservative operations to give relief. The adjustment of a proper prothesis is important from the point of esthetics, and to prevent epiphora, entropion and chronic inflammation of the conjunctiva.

In war injuries of the eye which necessitate enucleation, **Bergmeister** advises transporting the patients to the ophthalmic hospital rather than attempting to remove the eye at the field hospital. He believes that the danger of hemorrhage and other complications is thereby lessened.

A review of the subject of enucleation and the operations practiced as substitutes for it has been published by **Shoemaker.**

Implantation Operations—The Frost-Lang operation of inserting a gold ball into the orbit after enucleation of the globe is described by **Hansell**. The author slightly modifies the procedure by suturing the muscles to the conjunctiva before enucleating the globe and separating Tenon's capsule from the conjunctiva and suturing it separately over the gold ball. The conjunctival wound is then closed. Instead of using cat-gut, the author employs fine silk.

A case in which Carter had done Mules' operation 31 years ago was seen and reported by **Grimsdale.** The movements of the stump were good and a shell eye had been worn without trouble. (See also the section on the orbit.)

Prothesis.—The one-eyed of the war is the subject covered by **Valois'** monograph. The author describes the surgical preparation for the eye and the preparation of the prothesis; the types of deformity of the socket which he considers under three headings: (1) Cicatricial bands, (2), Cicatricial contractions, (3) symblepharon, partial or complete. The surgical method of dealing with complications is considered and the subsequent insertion of a carefully constructed conformer is recommended. The various methods of orbital reconstruction are fully described.

The Lacrimal Apparatus

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This section carries the literature from July, 1919, to July, 1920. For previous references, see A. J. O., vol. 2, 1919, p. 225.

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DIGEST OF THE LITERATURE

Physiology.—From experiments **Rochat** concludes that under normal conditions a pressure of 17 to 22 cm. of water is required to force fluid through the lacrimal canal. When a greater pressure is required the lumen of the canal is pathologically narrow.

Absence of Tears.—The patient of **Fuchs** complained of dryness of the eyes and photophobia which had lasted five years. She was 54 and had goitre which developed at the menopause. Pilocarpin did not cause salivary secretion. The Wassermann was negative. The Meibomian secretion normal.

Dislocation of Gland.—Hereditary dislocation of the orbital lacrimal gland is discussed by **Löhlein.** He illustrates his paper by the report of a case, and concludes that symmetric dislocation of the orbital tear gland is not always seen in connection with inflammatory cases, or in connection with a blepharochalasis, but also in self-limiting diseases in which the gland is likely to increase in size. It is observed mostly in young people, and microscopic examination reveals no abnormality of the gland.

Granuloma of Lacrimal Gland.—A case in which there had been enlargement of the lacrimal gland on the left side was reported by **Wells.** The patient was a woman, 53 years of age, who gave no history of tuberculosis, and the Wassermann reaction was negative. The tumor was removed and on microscopic examination was found to be a granuloma. Tubercle bacilli were not found, and no evidences of recurrence have been noted for three years. The author concludes that the case is one of infectious granuloma of the lacrimal gland.

Extirpation of Gland.—Extirpation of the lacrimal gland in epiphora is the subject of a paper which was read by **Holmes.** For the relief of troublesome tearing the author has practiced extirpation of the orbital lacrimal gland and the tear sac for thirty years. Ten cases in which the operation had been performed are reported. Nine of the cases were followed for several years and in all the results were uniformly good. Holmes concludes that extirpation of the gland is a safe procedure; that after its removal there is sufficient secretion to moisten the globe; that removal of the palpebral gland is not as satisfactory as extirpation of the orbital gland.

From a study of fifty anatomical specimens the essayist gives the following average measurements of relations of the nasal duct to contiguous structures. Distance of the opening of the duct from the floor of the nose: greatest, 22 mm.; least, 9 mm.; average, 16 mm. Distance from labio-nasal junction: greatest, 34 mm.; least, 25 mm.; average, 30 mm. Distance of the outlet above lower edge of inferior turbinate: greatest, 14 mm.; least, 3 mm.; average, 10 mm.

Anatomy of Tear Passages.—After studying the anatomy and histology of the lacrimal canal of several domestic animals, **Lichal** noted that in the pig and dog the opening develops during the first month of life. In the horse, cow, goat and pig, numerous goblet cells are present in the epithelial lining of the duct. In the tear sac and canal of the horse mucous glands with widely open mouths are found and fat tissue is noted in the subepithelial network of the first segment of the canal. In the pig there is a ring of connective tissue at the punctum which serves to hold the canal open.

In **Schäffer's** well-illustrated book on the nose an interesting chapter is devoted to the lacrimal canals.

Epiphora.—Slitting of the canaliculus in the treatment of epiphora is an operation often resorted to when necessary. **Würdemann** believes that it should not be done except occasionally when pus is present in the sac.

Anomalies of Tear Passages.—A woman consulted **Lampert** because of failure of vision due to senile cataracts. Upon examination the author found a peculiar anomaly of both lower canaliculi. The right canaliculus was slit for 3 mm. of its course. The groove started 1 mm. to the nasal side of the punctum and ran inwards. A probe could be passed through the punctum and canaliculus to the groove and reinserted into the canal near the nose and then passed into the sac. On the left side a similar condition existed, but the groove was not so prominent and was only 2 mm. long. The superior canaliculi were perfectly formed, but were 1 mm. shorter than the inferior. The anomaly had existed since birth. The author explains the occurrence of the condition on embryologic grounds, and believes that there was a failure of fusion of the lips of the lacrimal groove corresponding to this area.

Mycosis.—The literature on mycosis of the lacrimal canaliculus is collected and reviewed by **Ramon Nabajos,** and the author adds another case. The concretions were located in the upper right canaliculus. An eye-lash was found in one of the masses, and probably was the nucleus for the collection of the foreign material. Microscopically long radiating filaments which resembled the streptothrix were found in the concretions.

Brownlie has reported infection of the lacrimal sacs by blastomyces albicans, accompanying such infection of the tonsils and pharynx.

Nagel reported a case in which a concretion the size of a large bean was found in the lower canaliculus. The mass contained gram positive mycelia, resembling the actinomycoses.

Diseases of the Lacrimal Passages.—After reviewing the literature on diseases of the lacrimal passages, **Malling** reports his experience with 192 patients who had epiphora without any demonstrable evidence of disease of the tear passage. However, in 155 the nose or its adnexa showed some pathologic changes. Evidence of disease was found in the nose in 58 per cent of the author's cases of dacryocystitis.

A tumor-like swelling in the region of the fornix of the left lacrimal sac came under **Gerard's** observation. In the author's opinion the swelling was due to a hemorrhagic lacrimal cyst, which developed in three months, and was the result of a slow hemorrhage from a ruptured vessel in the wall of the sac.

A case in which there was a swelling over the lacrimal sac about the size of a lima bean which felt like a sebaceous cyst came under **Loeb's** observation. The author was uunable to determine whether the swelling was a cyst or due to dacryocystitis.

Koefler has written on disease of the tear passages of nasal origin.

Atkinson discusses abnormalities of the lacrimal apparatus.

The histo-pathology of excised lacrimal sacs was discussed by **de Schweinitz.**

Tuberculosis.—Of the 400 cases of operations on the tear sac in **Polyak's** series, 52 were complicated by tuberculosis of the nose or lacrimal sac. Of those affected, 6 occurred in men and 46 in women. In analyzing his cases he found that unilateral sac tuberculosis occurred in 15; fistulous tuberculosis of the sac and infiltration of one side, of which four cases came to extirpation of the sac, 21; bilateral tuberculosis of the sac, not fistulous, occurred in 4; bilateral tuberculosis of the sac, fistulous, occurred in 8; bilateral cases, one side tuberculous fistula and the other only suppurative dacryocystitis, 10; suppurative dacryocystitis but complicated by tuberculosis of the nose, one case of which was bilateral, occurred in 6; which made a total of 64 eyes.

Of the 52 persons tuberculosis of the nose was observed as follows: Nasal tuberculosis (one side) on the same side as the diseased eye, 12; nasal tuberculosis (one side) on the side of the well eye, 2; bilateral nasal tuberculosis, 17; healthy noses, 21.

One case in which the nose was healthy before the operation on the tuberculous sac was found to have contracted nasal tuberculosis after the operation.

Scrofuloderma was seen in seven cases, in three the nose was not involved, and in four tuberculosis was present in the nose. Ectropion from scar tissue was seen once, tuberculosis of the conjunctiva once, glandular tuberculosis twice, and bilateral trachoma twice.

In most cases the results immediately

after the operation were uniformly good, suppuration and epiphora stopped, the fistulae closed in from two to three days, and signs of inflammation rapidly disappeared. In some cases the healing did not progress so smoothly, and there were local recurrences. The recurrences usually manifested themselves within three months from the date of operation. The final outcome depends to a great extent on the intelligence of the patient and his willingness to co-operate. The author was able to follow up only twenty-three cases—twenty-six eyes.

Treatment of Dacryocystitis.—Because of the chronic nature of dacryocystitis, **Francis** believes that the oculist should teach the family physician to probe and syringe the sac, so that he can treat these cases and save the patient the time and expense of traveling to the city for the services of an oculist. **Wessely** has reported on the treatment of chronic dacryocystitis with injections iodin.

To eliminate purulent secretion from the lacrimal sac, **Vacher** and **Denis** use 1/3 cc. of chromic acid in 1:50 solution. The mixture is injected into the inferior canaliculus while an assistant floods the eye with hydrogen dioxide to neutralize the excess of the acid. After the acid has remained in the sac for two or three minutes it is rinsed out with hydrogen dioxide. Preliminary cocainization of the eye and lacrimal passages is necessary. For several days after the treatment the eyelids are washed with hot water and the excess secretion is squeezed from the sac. The authors believe that by this method dacryocystectomy is often avoided.

The efficacy of Urraca's methods of treating dacryocystitis is discussed by **Santos Fernandez**. (See 1919, Nov., p. 235.)

In treating dacryocystitis **Green** uses Thompson's method of curetting the sac, combined with rapid dilatation. He first dilates the punctum, then irrigates the sac with 1/5000 $HgCl_2$ and uses 5 per cent cocain combined with epinephrin to anesthetize. The lower canthus is then freely slit. With a medium-sized curette the sac is gently scraped. A Theobald's probe (5 or 6) is then passed through to the nostril. After withdrawing the probe a few drops of ten per cent cocain solution is injected into the sac, and curettage is carried out according to the technic of Thompson. The author then introduces a 12, 13 and 14 probe one after the other and in some cases uses as large as a No. 16. He then applies the tincture of iodin to the tear passages with a small pledget of cotton wound around the applicator.

Green reports the results obtained in sixteen cases and concludes that the combined operation of curettage followed by immediate rapid dilatation possess the following advantages: 1. Foreign bodies, polyps and granulation tissues in the tear passages are removed. 2. The duct admits larger probes at the first sitting, thus insuring adequate primary and secondary drainage. 3. The tincture of iodin sterilizes the mucous surface and stimulates it to normal activity and regeneration. 4. The operation can be repeated if pus should reform. 5. Secondary operations can be done successfully as if nothing had been done. Illustrations of instruments used by the author accompany the essay.

In obstruction of the lacrimal canal, **Ogawa** splits the canal with a Graefe knife through the stricture, and probes daily until it remains open.

Fistula.—In treating suppuration of the tear sac with fistula, **Piesbergen** and **Weiss** insert an "Ortizon" pencil as far as possible into the fistulous opening.

Resection of Nasal Wall.—A 6 mm. trephine is used by **van Lint** to drill a hole through the nasal wall to re-establish the drainage of tears into the nose. After packing the middle meatus of the nose with gauze, to protect the nasal septum, van Lint makes an incision through the skin and deep fascia into the lacrimal sac. He then introduces his trephine into the wound, directing it so that the handle of the instrument touches the orbital arch, and drills through the nasal wall. A strip of gauze is then passed through the opening into the nose to control the hemorrhage. After the bleeding has ceased a rubber drainage tube is tied to the gauze and pulled into the nose until it rests on the nasal floor. Then the upper end of the tube is cut off flush with the floor of the external wound, and the lips of the wound are sewed together with endodermal sutures. On the eighth day polyvalent serum is injected. The tube is removed through the nose on the fifteenth day, and the cavity washed frequently through the canaliculi. The author reports good results in most of his cases.

In all cases of obstruction of the lacrimal drainage apparatus in which there is an actual stenosis in the duct and complications in the sac, **Wiener** advises either extirpation of the sac or dacryocystorhinostomy. A modified Toti operation as described by the author, Y. B., 1917, has given Wiener very gratifying results. To obtain permanent relief occasional probing, which is painless, is necessary.

Two cases in which the Tilly bur had been employed intranasally to open the lacrimal sac into the nose were presented by **Chase.**

The cure of suppuration of the tear sac by West's operation is the subject of a paper by **Heermann.**

Benedict and **Barlow** describe their technic of performing the intranasal operation for dacryocystitis. Illustrations show the different steps of the operation. Attention is called to the frequency of ethmoidal infection in cases of dacryocystitis. If the ethmoidal cells are affected, they also should be opened and drained at the time of the operation on the sac.

Mosher read a paper on his method of dacryocystorhinostomy as described in the Y. B., 1919. Ziegler in discussion stated that from his observations, rapid dilatation has given as satisfactory results in his cases as the various intra-nasal operations, and Posey, Ring and Zentmayer all prefer the excision of the sac to dacryocystorhinostomy.

Destruction of the Sac.—As a radical procedure, **Maxey** agrees with Gifford that the destruction of the lacrimal sac with trichloracetic acid is applicable to acute as well as chronic cases. The author obtained satisfactory results in six cases of suppurative dacryocystitis treated by this method.

Extirpation of the Sac.—With illustrations **Colin** describes the topographical anatomy of the lacrimal sac and the steps necessary for its extirpation.

When excising the lacrimal sac, **Posey** employs Meller's operation. A 2 per cent solution of novocain is substituted for cocain. The author emphasizes the necessity of severing the sac, first below and dissecting upward toward the more vascular apex to minimize the hemorrhage. After the sac is thoroughly excised the edges of the wound are carefully coaptated with interrupted sutures. The sutures are removed on the third day.

Posey advises the removal of the sac in all cases where there is a mucopurulent discharge from the sac, and in all mucoceles where pressure fails to evacuate the contents either into the nose or the conjunctival culdesac; also of all infected sacs before operations necessitating incision into the globe and in neoplasms of the sac.

When conservative methods have failed, as syringing and probing, and the infection continues, even after the use of antiseptic solutions like optochin or hermofenil, **Escolano** recommends the radical treatment. The best method, according to the author, is extirpation of the lacrimal sac, according to Professor Blanco's procedure. The dressings are removed in six hours after the operation and the patient is discharged in six to eight days.

A case of bilateral glaucoma associated with dacryocystitis on both sides was reported by **Barreal.** The author extirpated the lacrimal sacs to remove a possible source of infection before operating on the globe for the relief of the glaucoma. **Jesus** discusses extirpation of the lacrimal sac.

Diseases of the Lids

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This section carries the literature from June, 1919, to July, 1920. For previous references see A. J. O., November, 1919, p. 236.

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DIGEST OF THE LITERATURE

Physiology.—Hasselmann thinks that the regular movements of the lids exercise a certain pressure on the cornea, bringing about a massage favorable to escape of the ocular fluids through the canal of Schlemm.

Anomalies.—A case of congenital coloboma of both upper lids is reported by **Marquez.** An excellent esthetic result was obtained by resort to the Dieffenbach method of blepharoplasty. **Zamoso** reports a case of bilateral congenital ankyloblepharon. The bands of tissue uniting the lids prevented their separation more than 3 mm. **Van Duyse** has written on anomalies of the face and lids.

Anomalous Innervation.—Martyn observed in a man, aged 44, when looking down and to the right, that the left elevator of the upper lid was thrown into action, opening the eye widely. More detailed examination revealed that on extreme rotation to the right, on a level with the eyes, the right elevator came into action; and increasingly so, as the eyes were rotated to the right. A table is given for the position of the left upper eye lid for different directions of the eyes; two reproduced photographs illustrate the condition. Vision, right and left, 6/24, which rose to 6/9 with correction. No diplopia and no strabismus; moderate esophoria. Discs congested and their margins not well differentiated from the surrounding fundus. Fields slightly contracted on the temporal side. Syphilis in 1895, but the muscular anomaly existed prior to that date. As to etiology, the reporter suggests anomalous innervation, from the branch of the inferior division of the third nerve supplying the internal rectus; but expresses doubt as to the possibility of such an anatomic arrangement.

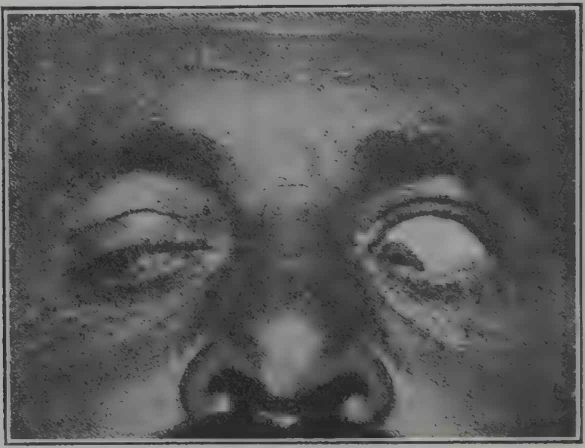

Fig. 18.—Anomalous movements of lids. Left lids retracted on looking down and to the right. (Martyn.)

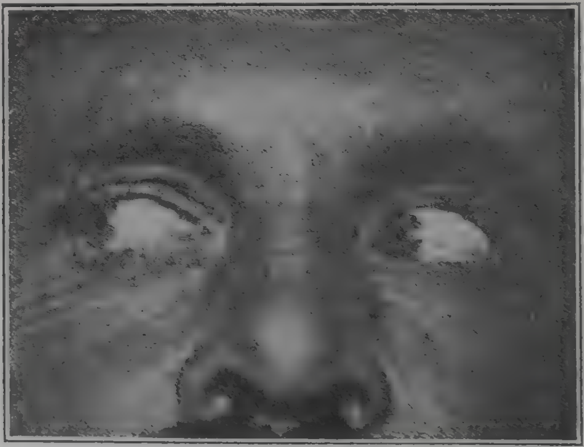

Fig. 19.—Anomalous movements of lids. Right eye more widely open on looking to the right on the level with the eyes. (Martyn.)

Regarding the syndrome of Marcus Gunn, which consists in associated movements of the upper lid with those of the jaw, **Marin Amat** concludes that the syndrome is suggested physiologically in some healthy persons who open their mouths simultaneously with their eyes. Normally, the superior branch of the motor oculi contains fibers derived from the motor portion of the trigeminus—suggesting a functional synergy. In animals which keep the palpebral commissure open while eating, there must be anastomoses to assure such synergy. Although the functions of these fibers in man are unimportant or rudimentary, it may happen that in ptosis of the lids, their function develops and even surpasses the normal limits, constituting an additional function rather than a synergy.

The junction of these fibers from the

fifth nerve with the third must take place at the periphery. There must also be peripheral liaison between the fifth, seventh, third, and fourth, third and sixth cranial nerves, and between the latter and the sympathetic. The superior branch of the motor oculi frequently receives in the orbit a filament from the ophthalmic nerve or its nasal branch; although this may contain, as is probable, no motor fibers, it strongly suggests the possibility of other anastomoses, motor in this case, between the trigeminus and third nerves.

The above hypothesis explains: A. Cases where the syndrome is present without ptosis, both congenital and acquired; B. Its coincidence with palsies of the elevator whether of cortical, subcortical, nuclear or funicular origin. (The third nerve contains no filaments from the motor portion of the trigeminal which reach it in the orbit or its neighborhood). C. The cure sometimes obtained by training isolated movements of the lids by the will and thus freeing the connection which unites the movements of the latter to those of mastication.

Ptosis.—Three cases of the Claude Bernard-Horner syndrome are described by **Barbe**. All the cases were consecutive to wounds of the neck. **Meirelles** reports a case in which this syndrome arose from aneurism of the aorta.

In a case of congenital ptosis, with marked weakness of the superior rectus to such a degree that this muscle could not be used to supplement the elevator, **Duhamel** determined to isolate, by dissection, a segment of the small venous arcade in the subcutaneous cellular tissue below the margin of the orbit, and to utilize the elastic force of this venous canal to raise the lid. Normally a very feeble force suffices to raise the lid; on the other hand, there is a great difference between the closing power of the orbicularis and the elevating strength of the elevator. Physiologic closing of the lids, as is known, is preceded by relaxation of the elevator. The question arises whether elastic tension, slight but continuous and acting in the direction of the elevator, might not interfere with closing of the lids.

Experiments with an India rubber band held in position by collodion, appearing satisfactory, the reporter decided upon intervention. Should the result be disturbing, the effect of the elastic band of veins could be readily undone. The elasticity of the veins varies with the age; in an adult, the veins may be lengthened at least half again without surpassing the limit of their elasticity.

To obtain a satisfactory result in a case of complete ptosis, the lid should be raised from 7 to 8 mm; by isolating a venous length of 3 cm., the venous segment, fixed at both its extremities, would have to undergo a lengthening of approximately 6 mm., say 20 per cent of its total length, in order to permit lowering of 7 to 8 mm. from the fixed point to the tarsus. A cutaneous incision of 3½ cm. in length was made slightly below the inferior border of the margin of the orbit; a venous segment about 3 cm. in length was dissected out and isolated; this was fixed by catgut to the inferior margin of the frontalis and to the upper border of the tarsus through a button hole in the orbicularis; a small rectangle of skin was dissected and sutured. The result was almost normal functioning, though the effect of the venous arcade appeared slightly weak.

Briggs analyzes 64 cases of hereditary congenital ptoses. Among 128 members, 74 males, 53 females, of unknown sex extending through 23 families of six generations, covering a period of 125 years; in 17 of which the father and in 6 the mother transmitted the malformation. In no case did affected parents fail to transmit ptosis to one or more of their offspring. Inheritance in every case is direct, no generation in the lineage of the affected being skipped, except in one instance, whose parents were said to be normal. There was only 1 case of intermarriage; of the 2 male offspring 1 was affected. The report is followed by an interesting discussion of the literature, pathology, etiology, etc.

Epicanthus and congenital ptosis in a child are reported by **Pockley**. The epicanthal fold partly covered the cornea of each eye, and the ptosis (bilateral) was so great that the lids were quite closed, and had to be raised with the finger to see. The operation for the former was a modification of Rogman's, slightly altering the shape of the incisions and excising the V-shaped portion of the skin instead of transposing them. A few weeks after this operation the ptosis was dealt with by Hess's well known operation of subcutaneous fixation of the lid to the occipito-frontalis, which acts as a levator. Both operations were done on one eye at a time, three weeks apart. The only difficulty in the operation lies in the estimation of exact amount of skin to be removed, any slight remaining epicanthus disappears with growth and development of the nose.

Davis reports a case of double congenital ptosis in a child of 5 years upon which he had performed the de Grandmont operation; 3 mm. of the cartilage, skin and orbicularis were removed from the left lid and 2½ from the right, and the wounds closed by interrupted sutures reaching entirely through the lids. His experience with the de Grandmont operation had been very favorable, as this case shows, and he had never seen an over effect even when rather large sections of cartilage were removd.

Zentmayer records a case of congenital ptosis to emphasize the value of the Shoemaker modification of Motais's operation. The child was aged 5 years, and the superior rectus so frail that the procedure would have been impossible had not the open method been used; the result, while not perfect, is very good.

Giri reports a case of a girl, aged 17, whose eyes "were not working right" according to the mother's account, since she was three months old. At examination the left eye was found normal, but in the right eye there was no upward movement beyond the midpoint of vertical rotation. The effort makes it obvious that the right orbicularis palpebrarum and the occipito-frontalis muscles are efficient, as the skin of the forehead and upper lid was thrown into folds. There was no diplopia even when the right upper lid was lifted. Vision R. 5/24; L. 5/6.

The superior oblique was tenotomized, and the paralyzed superior rectus advanced. As this proved satisfactory Giri proceeded to correct the ptosis; and used the Hess operation in spite of the contraindication of danger of disease of the cornea; the paralysis of the superior oblique preventing the eye being drawn up under the lid during sleep.

Weisser reports a case of non-paralytic ptosis of the right eye, having existed a little over a year. With this ptosis there is a peculiar partial paralysis of the right superior rectus at times. Muscle balance does not show any deviation from the normal, orthophoria being present in all directions, though under cover, the left eye occasionally turns slightly upward. The ptosis is not always present, but at times the lid will twitch and then fall and remain down for varying periods. Both eyes are otherwise normal with hyperopia of +0.50. No history of trauma or syphilis; Wassermann negative. The diagnosis of hysteric ptosis was made. **Rosenheck** reports a case of blepharoptosis of psychogenic origin.

Lancaster writes upon the operative treatment of ptosis in respect to the four operations which he regards as the most satisfactory. These are: (1st) vertical shortening of the lid by excision of a piece of tarsus, (2nd) advancing the levator, (3rd) Motais's operation (where the levator is useless but the superior rectus is available, and (4th), where both the levator and superior rectus are paralyzed, by substituting the frontalis. The writer has operated in one case to secure connection between the lid and the frontalis by transplanting a piece of fascia lata. The technique of these operations is given in detail and illustrated by diagrams.

Paralysis of the Lids.—In a case of peripheral epilepsy **Penichet** observed paresis of the orbicularis with ptosis of the lower lid and complete anesthesia of the skin over the inferior palpebral region and zygoma followed the attacks. This condition lasts for a period of from 20 to 30 days and gradually disappears completely.

Leriche observes that certain cases of facial paralysis, the result of war wounds, are incommoded by permanent inability to close the eyelids. Some cases may be remedied by muscle transplantation, but in others this method is impossible owing to loss of tissue. In these he has performed section of the cervical sympathetic to bring about retraction of the eyeball and narrowing of the interpalpebral space and thus effectually combat lagophthalmos. He reports an eminently successful case.

Harris also reports lagophthalmos and **Mendicini**, tonic unilateral paralysis of eyelids. **Ishida** reports a case presenting an atypical Bell's phenomenon.

Pediculosis of Lashes.—A case of pediculi of the eyelashes is reported by **Hill.** The hair was quite free from infection and all knowledge of disease was denied. A weak lysol solution and dilute ammoniated mercury ointment soon destroyed both parasites and ova.

Angioneurotic Edema.—A patient with angioneurotic edema was observed by **Bell.** When first seen there were marked edema and swelling of both eyelids which did not pit on pressure, and big bags under both lower lids; the lips and throat were also swollen and the patient at times had great difficulty in breathing. The attacks passed away in 24 to 36 hours, leaving the patient well until another attack; he has had the trouble 17 years. Urine normal, as was also the blood pressure. The patient attributed the attacks to changes in the weather, but the reporter ascribed them to some protein toxin. **Marshall** reports edema of lids caused by ants. **Barber** has written on herpes zoster involving the thorax and ophthalmic division of the trigeminus.

Cutaneous Horn.—A growth of this kind from the lower lid 14 mm. long is reported by **Bell.** These horns are very rare. This was the second seen by him in twenty years. **Campbell** urges the value of electrolysis for warty growths, moles and other excrescences on the skin of the lids.

Vaccinia of Lids.—Bedell reports a case of mutiple vaccination of the eyelids in a woman having no immunity from previous vaccination; the infection having been transferred to the eye by the patient's hand from the arm of her child. When first seen by the reporter, one week after infection, the middle two-thirds of the right lower lid margin presented an ulcerating surface with loss of the cilia over an area of about 10 x 4 mm. Two days later a definite vesicle was seen at the nasal margin of the eyebrow; the entire side of the face was swollen. The cornea remained clear. The left eyelids became affected with a small vesicle upon the upper and another on the lower lid. The right lower lid became so tense that that the large ulcerating surface was in contact with the cornea, producing a slight superficial haze; this increased with interstitial infiltration. The cornea perforated with a minute opening.

Three weeks from the day of infection, symblepharon of practically the entire lower lid and eyeball was noted. The anterior chamber had quickly reformed without iris adhesion. Six weeks subsequently the vision was 20/200 with a diffuse corneal haze. Some months later a successful operation for the symblepharon with flaps of rabbit's conjunctiva was performed. Vision finally rose to 20/30 with correction. The cornea of the left eye was unaffected. A very complete bibliography of 92 cases is appended. **Espiño** also writes on vaccinia of the lids.

Syphilis of Lids.—In their report **Couce** and **Poyales** give a large color photograph showing tertiary syphilitic lesions of the inner angle of both eyes; an actual syphiloma of the right eye, in a man aged 40 with two healthy children. The primary chancre was acquired at 30 and treated by a course of mercury. There had been no other signs of syphilis until the development of the above lesions in the eyelids.

Xeroderma Pigmentosum.—Nelson observed a case of xeroderma pigmentosum showing a thickened condition of the lower lid and ectropion; ulcerative keratitis was also present. The affection usually begins between the sixth month and fourth or fifth year. The pigment very much resembled freckles which appear on the exposed surfaces, such as the face, neck and extremities. The pigment becomes deeper and later takes on a warty appearance with ultimate ulceration; the tendency is to degenerate into a malignant epithelial type with fatal prognosis. Sun and wind are the causative factors. Treatment is palliative. Up to 1870 only a few of these cases had been reported; between that time and 1910 something less than 100 cases had been recorded in the medical literature of the United States.

Lederer, in an extensive investigation of the subject, found in 46 cases of this disease ten with ocular complications. It usually occurs in early years from two to ten years, or at puberty. The eye manifestations in all of the ten cases were photophobia, lacrimation, and other visual disturbances; the lids red with pigment flecks, telangiectasis, cicatricial disfigurement, atrophy, papillary eruption, and swelling. There may be shrinking of the conjunctiva with cicatricial formation resembling symblepharon. The localization of the disease in the cornea may be superficial or deep. Beginning in the limbus it may encroach upon the cornea as a tumor, extending to the iris and pupil, and reaching the ciliary processes, ends in phthisis bulbi. The treatment is that for malignant tumor, and the ten patients of Lederer were also subjected to the influence of direct sunlight.

Müller contributes to the literature of xeroderma, and considers the disease similar to epithelial tumor, or a flat epithelial cancer, the disease affecting the corneal epithelium in much the same manner.

Chalazion.—Bellencontre thinks that chalazion never occurs in emmetropia, but is present exclusively in ametropia, and **Doesschate** questions whether chalazion may be a result of errors of refraction.

Trichiasis and Distichiasis.—The report of **Raoulx** refers to 307 operations for trichiasis by Panas's method, slightly modified, which he has performed in Morocco. He has chosen this method because it is easy of performance, without the aid of an assistant; and can be readily taught to general practitioners in a country where ocular affections are so widespread that every physician should recognize and be able to treat the commonest. He describes the necessary instruments and technique in detail with a few important comments. The forceps should be such as assure satisfactory hemostasis. Most so-called trichiasis forceps are too large for introduction into a cul-de-sac narrowed by long continued trachoma; he prefers for this purpose Desmarres chalazion forceps. The proper width to be given to the flap is very important; if too large it is unsightly and disturbing to the patient; if too small, it may slough; the latter may be provoked by tying the sutures too tightly. In some cases the external canthus should be divided in order to suppress for the time being the contractions of the orbicularis which are sometimes of extraordinary power in the natives living under a hot sun and frequently without adequate protection from a hat. The results of the operation are generally satisfactory and permanent.

Of 325 operations on the lids, **Barrada** has done 60 operations for trichiasis and entropion, 55 for trachoma, 25 for ectropion, and other cases were treated for apparent mechanical ptosis, colloid degenerations of the cartilage, and the removal of cysts and tumors in the cartilage of the lids. Ptosis as a complication did not occur in any of his excision operations, and where granulations occurred he simply snipped them. After much experience with the combined excision operation, the author feels encouraged to consider it a radical cure for trachoma and trichiasis. He gives the steps in his operation in detail.

In doing the Panas operation for trichiasis and distichiasis **Ekdawi** found that a rough area was left on the conjunctival surface of the lid caused by pulling up of the lower portion of the lid above the edge of its upper part. He succeeded in changing this method by the following operation: The skin is incised horizontally 2-3 mm. above the lashes, and then through the muscle down to the cartilage. The latter is made bare over all its surface, by undermining the muscle below as far as the roots of the lashes and up as high as the attachment of the cartilage above. Then the lower part of the muscle is removed, so that the roots of the lashes appear as black dots. Ekdawi considers this lessens the thickening of the lid and gives better shape. Then he cuts through the cartilage horizontally from one end to the other and

2-3 mm. above the roots of the lashes, cutting through the conjunctiva, and removes the lower part of the orbicularis.

In Panas's operation the sutures will drag the lower part of the lid over the upper portion; Ekdawi makes mattress sutures by passing the needle through the skin and muscle 3 mm. above the incision, then through the upper portion of the cartilage, then through the lower portion of the lid behind the roots of the lashes out to the intermarginal line, back again through the same structure in the opposite order, making a loop with the ends of it up through the skin and 3 mm. apart. Three similar sutures are inserted and tied by double turns after Snellen. This will bring the upper portion of the lid behind and at right angles to the lower part. He has done more than 200 lids by this method and has never had a case of gangrene.

To restore missing lashes, **Esser** takes a strip from the eye-brow to be sutured to the edge of the lid. He first slits both eyebrow and eyelid lengthwise, and sutures the near lips of each together thus forming a kind of tunnel lined with skin. When this has healed, he sutures the other lips together, the upper part of the eyebrow and the lower part of the eyelid, covering the other suture. An incision is next made through both, just below the hair in the eyebrow and just above the hair strip that was first sutured to the upper lip of the lids; this leaves the eyelid with a strip of hairs. Illustrations accompany the article.

Entropion.—A case of entropion, said to be congenital, was seen by **Dabney** in a child 6 months old. The lashes of each lower lid were turned completely inward against the eyeball, and had caused chronic conjunctivitis. He removed a small elliptical segment of skin and palpebral muscle and brought the edges together, giving complete relief.

Zentmayer operated successfully for congenital entropion of both lower lids, by removing a crescent of skin with a few of the underlying fibers of the orbicularis. Mayou states that these conditions are never true entropion, but a malposition of the cilia. In this case the margin of the lid was rolled in also; it may therefore be properly termed congenital entropion. **Cantonnet** takes up the treatment of spasmodic entropion.

Because many patients will not submit to the removal of mucous membrane from the mouth for grafting purposes, as practiced by Van Milligen, **Mahfouz** used the peritoneum of the rabbit, and later found that the peritoneum of the frog proved to be quite as good. The frog is kept in a pail of clean water the night before the operation; then brushed with soap and water and dried. It is then "pithed" and the whole body dipped in a 2 per cent tincture of iodin for some time. The abdomen can then be opened and the peritoneum exposed for the surgeon to choose which ever part suits the raw surface best. The graft is placed with the glistening endothelial surface outward, and smeared with boric ointment. The stitches are removed after three days.

In discussion MacCallan said that he had seen a number of these operations; two cases were extremely satisfactory, in several others the transplanted peritoneum merely necrosed, while in eight or nine the graft disintegrated after some days. He thinks the results less satisfactory than with the Van Milligen operation, and would deprecate any widespread experimentation with the method.

Ectropion.—Four cases of cicatricial ectropion of the lower lid treated by blepharoplasty are reported by **Sadek.** Case one came complaining of inability to open his right eye, which he thought had resulted from a large abscess in the lid. Cicatricial thick bands were found encircling the palpebral fissure. This caused ectropion of the lower lid and entropion of the upper by pulling on the skin of both canthi. The cornea was faintly nebulous, but through the aperture could see up to 6/36. The left eye was blind. A plastic operation on the lower lid, by Fricke's method, removing the cicatricial bands in the upper gave an almost normal palpebral fissure, with V=6/12. In case two, with entropion of right upper and ectropion of right lower lid, Snellen's operation was done on the upper lid and a week later Wolfe's operation of dermic grafting was performed on the lower, with success. The graft was taken from the inner side of the forearm. Case three, an old man, was operated upon by Fricke's method with success.

The fourth case was one of severe cicatricial ectropion of left lower lid with symblepharon in the form of a thick band of conjunctiva attaching the lower lid to the corneal margin and put on the stretch by the displaced lower lid. By grafting the right upper and lower lids and at the same sitting relieving the symblepharon in the left eye, grafting the raw surface on the sclera by a mucous membrane graft, and later doing a blepharoplasty on the left lower lid, taking the pedicled flap from the temple, the ectropion was relieved.

Werner reported on a case of ectropion on which he did a Truc's operation on each eye, with good result. He thinks the effect can be augmented at will by pulling up the outer segment of the lid. **Bordes** reports a case of cicatricial ectropion of the left lower lid, resulting from malignant, pustule relieved by plastic operation. After preparing the surfaces the lids were stitched together, and the denuded area covered with dermo-epidermic grafts. **Hessberg** has described an operation for correcting ectropion of the lower lid at the inner canthus. **Pichler** reports traumatic fistula of the lid with ectropion. **Komoto** writes on operations for ectropion.

Blepharoplasty.—In his Bowman lecture **Morax** points out the advantage of pedicled flaps lies in their good vitality, and the absence of tendency to shrink. The disadvantage is the linear scar left. To minimize this the incisions must be as deep and accurate as possible and the sutures removed at an early date, two to four days after operation. Dermo-epidermic grafting without pedicle, if aseptic, is almost as sure to take, but is followed by contraction. With thicker grafts the survival is not so certain, and the contraction may be very great. It is to be resorted to only exceptionally.

Morax describes the process by which the graft comes to adhere and become a part of the body tissues. In the early stages, say for two days, there is very little connection between the graft and the tissue on which it is laid, and great care must be taken not to displace it. After that small capillary vessels extend out into the graft, but can be easily broken, causing bleeding. By the end of ten or twelve days it requires close examination to recognize the boundary of the grafted tissue.

From his large war experience **Ombredanne** has come to appreciate the greater importance of the lining flap over the cover flap. Skin lining flap will prevent cicatrization from effacing the palpebral cul-de-sac. To impress its importance he says: "The lining is everything, the cover nothing."

Dubreuil reports a simple method of grafting as follows: The skin is arised on the point of a curved needle and a piece 2 mm. across is detached by passing the bistoury beneath the needle point. This is immediately deposited on the raw surface, the point of the bistoury being used to detach it. The graft contains both epidermal and deeper tissue.

McKee gives a short account of Esser's method of enlarging the conjunctival cul-de-sac, or rather in retaining the enlargement; and the modifications suggested by Gillies, Waldron and Risdon. Esser enlarged the conjunctival sac by means of a buried skin graft. An incision was made through the eyelid skin; the tissues were then under cut without perforating the conjunctival sac; an impression of the cavity thus formed was taken with sterilized dental compound. A thin Thiersch graft was then taken from the inner surface of the upper arm and wrapped around the mold; the whole was inserted into the cavity and the margins of the incision carefully sutured over it. At the expiration of two weeks an incision was made through the conjunctiva overlying the mold, which was then removed; and the epithelialized area thus formed maintained by the immediate insertion of a temporary shell until an artificial eye could be fitted.

Waldron very materially modified and improved the technique by making the primary incision in the conjunctival sac instead of through the eyelid skin. McKee believed the suturing in of the compound so that the conjunctiva had to be cut to release it was a mistake. He leaves a space at the top so that while the compound and graft were still held in place, the former could be removed without any cutting. Risdon has improved on this idea and keeps his graft over compound in place by the pressure of the lids alone.

McKee observes that each case must be studied on its merits and where one variation may suit one case, it may not answer in the next, which will require some other modification. Gillies has proposed two modifications of the Esser process. In the first, called by him epithelial outlay, the mold covered with graft is buried in the subcutaneous tissues through an incision in the skin and is removed through the same incision; the cavity opened is covered with skin; it is really the converse of the inlay. The second method of Gillies is termed epithelial overlay, and is of great service where there has been extensive loss of tissue. Here extensive undercutting may be necessary, before the remains of the eyelid can be brought to its normal position, and the covering in of a graft-covered mold is impossible. In that case the remains of the eyelid may be sewn in a favorable position, the scars excised and an impression taken of the entire raw area. A Thiersch graft is then applied to the raw area and held firmly in place by means of the compound impression. These methods, while not a panacea, give results vastly superior to any previous ones and offer much to ophthalmic surgeons.

Heckel prefaces the description of his autogenous one-piece epithelial graft for the restoration of the eyelids with the statement that the injuries, such as burns requiring the operation, while severe, as a rule destroy only the skin and a portion of the substrata, leaving the underlying muscles intact. The real deformity and danger result from the extensive contraction following the destruction of skin. The problem then becomes to so separate the resulting cicatrix as to expose and replace the contracted muscles in their former position, and cover them with a layer of epithelium. The real problem is to so cover the defect that when the final shrinking of the graft has taken place it will remain sufficient. He believes that the advantages of an epithelial, over an whole skin graft, is self evident, and requires no argument. The operation divides itself into four distinct stages: (1) Dissection of the lid so as to expose and prepare the underlying muscles, (2) fixing the lid in a stretched position by anchoring it with several guy-sutures, (3) excision of the graft, (4) placing the graft in position, dressing and bandage. These various steps are described in detail and illustrated by diagrams.

Wheeler reports plastic operations for a few types of injuries of the eyelids with comments upon the same. They include: notch of the eyelid, associated with laceration of the tarsus; laceration of the lower lid from the inner canthus downward and outward; laceration of the lower lid near inner canthus with coloboma and cicatricial ectropion; coloboma at the outer canthus. The case reports are illustrated with photographs and drawings.

Snydacker describes his operation of blepharoplasty, which he performed four times for highest degrees of loss of tissue with resulting great deformity. He began at the angle of the jaw, cut diagonally a flap ten inches in length, turned it up to avoid kinking of the pedicle as much as possible. He laid this on a bridge of gutta percha, and covered the upper portion of the flap with gutta percha. He took a flap from the neck, turned it up, split in two the end, with one part covering the upper lid, with the other the lower. He left this flap in place seven or eight days, at the end of which time it was an easy matter to close the wounds in the neck. After seven or eight days he cut a bridge off which he did not need, because he was able to cover the wound in the neck very easily. In cutting off this bridge, he made use of only one suture to close the wound in the neck entirely. The rest of the wound had been closed at the time of the operation.

Morax took up the operation and modified it: instead of throwing away the bridge, when he had taken a flap from the neck, he turned it up, covered a part of the defect or as much as he could in the first operation, then instead of cutting this part away, he waited until circulation was established, leaving it a little longer than Snydacker did. He took the other part, turned that up and covered the rest of the defect with a portion of the skin which Snydacker had thrown away. Morax had performed this operation seven times.

Delmasso in Madrid and a German named Fulchen have also performed the operation successfully. An assistant of Morax has published an inaugural dissertation on this operation, with a resumé of the cases on which they had operated. This operation was not intended for slight defects, but to replace the old Italian method of Tageiocozzi of anchoring the arm to the head, especially rhinoplasty. The operation described was much more practical, simpler, and safer. The Thiersch grafts in the first result gave nicer looking and better acting lids. But where there were extensive defects, they shrank and degenerated, and the result was unsatisfactory. For smaller degrees of ectropion Snydacker performed an operation which he had reported a few years ago. It was simple, easy, and certain. Where he had a lower lid to deal with, he repaired the defect in one lid by using the skin of the other. He made a circular flap and used skin following the lines of the orbicularis and anatomic lines. If he wished to repair the lower lid, he loosened the outer angle of the eyelid; destroyed the hairs at the edge of the lid with a Graefe knife for a short distance, drew down the upper lid, brought the circular flap in place and replaced it. The ectropion could not return because the lines of shrinkage were in the direction opposite to the ectropion.

Carvalho, after a short account of Snydacker's publications and Morax's modification, describes the technique in detail: anesthesia, preparation of the raw surface, dissection of the cervical flap, fixation, section of the pedicle, secondary autoplasty as devised by Morax. He sums up the indications for the Snydacker-Morax method as follows: When large cutaneous surfaces are to be restored (both eyelids, rhinoplasty combined with palpebral autoplasty); cases in which it is impossible to obtain a sufficient extent of tissue from adjoining regions; or when disfiguring cicatrices would result from the latter procedure. In the above conditions, the method will give results which can not be obtained by any other plan, except perhaps the Italian method, which, however, has certain well known inconveniences. Three operations are described in detail.

Marquez briefly describes his own method of taking a pedicled flap and compares it with the operations of Fricke, Dieffenbach and others.

Blaskovics, in operations involving the replacing of the whole under lid, uses a transplant of tarsus and conjunctiva from the upper lid. This lower lid is immovable, but mobility is not essential. In some cases where the tear duct has been preserved, drainage of the tears is again established. The presence of tarsus in the reconstructed lid is essential to its proper position. If the fornix is absent, the reconstruction of the lid is the most complicated matter. Different methods must be used to meet different cases. The author describes his experiences in meeting emergencies of this kind. The article does not lend itself to a compact abstract.

Kalt observes that when the upper lid, including a part of the brow, has been torn away, the Indian method of restoration seems impossible. He does not believe that under these circumstances an epidermic graft will take, when the operation is done in one sitting. He has accordingly divided the operation into two steps: partial freeing of the pedunculated flap and covering the same with an epidermic layer, allowing time for organic union of the latter. Then to perform the operation in the usual manner. The flap with its two epidermic surfaces can be brought into the conjunctival cavity by the aid of a shell of glass, and sutured by its margins to the remains of the lid on the one hand, and to the contours of the orbit on the other. A case report, with two illustrations, accompanies the article.

Cramer reports a case of shell wound in which the eye and lower lid were torn away. When the case reached him the cheek, and what was left of the lower cul-de-sac conjunctiva, were drawn together, in a scar which adhered to the orbital bone. Upon pressure this bone was felt to have been deprived of its margin.

The first step of the operation was to loosen the adherent portion of the cheek and to undermine the conjunctiva. Into this pocket a cartilage flap from the ear was laid, taken from the whole length of the ear margin. This was sewed with fine stitches into the wound. After fourteen days the conjunctival side of the graft was laid bare, and that side of the graft was raised forward to form an orbital hole, to lay the foundation for a lower lid. After easing the scar tissue and making certain incisions to enlarge the orbit a prothesis was inserted. However, this had a tendency to slip out with the winking of the eye; because of the low flaring position of the lower lid. Three mattress sutures were taken through the soft part of the lower lid and the lower cul-de-sac, forming a normal under lid and insuring the safe position of the prothesis. A Thiersch graft was used to conceal the scarred portion of the lower lid, and after six days this was completely healed. The end results showed a palpebral opening with its prothesis slightly below the level of the other eye.

In doing a radical operation for suppuration of the frontal sinus which had caused extensive destruction of superficial tissues, **Halle** did a plastic operation. The flap was taken from the skin of the nose and rapid perfect healing secured.

Poulard reports excellent results in a series of palpebral mutilations. He had recourse particularly to thick pedicle flaps, which he subsequently thinned to improve the appearance.

Potts and also **Beck** report plastic operations restoring the lower lid, thus making the insertion of an artificial eye possible; and **Teske** reports a similar case. **Meyer** writes on plastic operations on the lids; and **Gil** and also **Kleefeld** record cases of artificial eyelids.

The Orbit

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This section of the digest carries the literature from July, 1919, to October, 1920. For previous references see A. J. O., November, 1919, p. 247.

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DIGEST OF THE LITERATURE.

Anatomy.—The results of cranial measurements reported by **Onishi** include some dealing with the region of the orbit. These are especially the extreme width of the malar prominences, the line joining which runs just below the lower margin of the orbit. The distance from the outer margin of one orbit to the outer margin of the other, and the distance between the upper anterior margin of the temporal fossae where these come nearest together on the level somewhat above the orbital margin.. His measurements were taken with calipers and special sliding scales.

Oetteking has written on the frontomalar sphenoidal region and its influence on the form of the orbit. **Nordenson** believes that the changes in the angle of the orbit at different ages are often responsible for the spontaneous correction of concomitant convergent squint.

Anomalies.—A case of meningoencephalocele protruding into the orbit with gliosis of the eye and orbital tissue is reported by **Van Duyse,** who points out the resemblance of this condition, both in origin and histologic structure, to intraorbital colobomatous cyst. The presenting tissue resembled in structure the cerebellum. Removal of the tumor caused death.

Drachter reports a case of cleft of the face extending from both orbits to the mouth with the umbilical cord impacted in the cleft, and an amniotic band caught in the orbit. It is claimed by **Cavara** that his case of congenital orbitopalpebral cyst in which the eyeball was represented by the cyst, is the first of its kind to be placed on record.

Voluntary Exophthalmos.—The case reported by **Lacroix** was that of a girl of 11, whose right eye was said to have been larger from birth, and noticed to swell when she cried or strained. This caused no pain and the child soon learned to make the eye protrude at will. The eyeball seemed normal, and not more prominent that the left when the patient was lying on her back. But it could be protruded 2 cm. in advance of the left. On cessation of effort it slowly returned to normal position. But its return was delayed by pressure upon the jugular vein. Varicocele of the orbit is given as the cause of the displacement. **Soriano** has also written on orbital varicocele.

Pulsating Exophthalmos.—This term is indefinite and, as **Menacho** points out, may cause confusion by being applied to cases differing greatly in origin, and in the seat of the causative lesion. He reports a case due to traumatism causing an aneurysm of the carotid within the cavernous sinus. The right side of the head was involved, the right eye blind; the left V.=1/4, but ophthalmoscopically normal. An intermittent systolic bruit was heard and an area of anesthesia. In the right temporal frontal region there was pulsation affecting the eyeball.

Under pressure bandage and pressure on the right carotid improvement occurred. The eyeball returned to normal position, bruit and pulsation ceased. The right optic nerve was found atrophic with vessels greatly contracted.

A case of pulsating exophthalmos of 65 years' standing was shown by **Grimsdale.** The patient was first exhibited in 1883 by Frost. There was paralysis of both external recti muscles. The condition followed an accident. Grimsdale calls attention to the general teaching that the third nerve is most often paralyzed in these cases. In his experience the sixth nerve was most often paralyzed. The author states that because of the anatomic position of the sixth it is more exposed to injury than the third.

The case reported by **Salus** was due to a shrapnel wound, which caused severe hemorrhage, immediate blindness of the right eye and bilateral pulsating exophthalmos. After two months there was discharge of blood and pus in the right ear. A pulsating tumor was observed at the external angle of the right orbit and the veins were enlarged on the left side. The bruit disappeared with pressure on the right carotid. The bilateral character of the symptoms was explained by rupture of the carotid into the cavernous sinus. The tension of the eyeballs was increased, but this could be reduced by pressing upon them and upon the carotid simultaneously.

In the case reported by **Margarucci** due to wound of the head by a grenade exophthalmos appeared on the left side, the right eye having been destroyed. Compression of the right carotid stopped the bruit. The right common carotid was ligated with immediate excellent result; but with subsequent return of the symptoms a little less severe than in the beginning. A second operation was undertaken and it was found that the circulation was largely re-established, not only in the external and internal, but also in the common carotid. All three were ligated and the symptoms disappeared permanently.

A slight exophthalmos, following fracture of the base of the skull, was combatted by **de Lapersonne** and **Sendral** by ligation of the carotids. After several weeks' training by intermittent compression of the opposite carotid, collateral circulation was satisfactorily established and only slight dizziness and mental fatigue followed the ligation of both carotids. A second case in which exophthalmos developed suddenly, twenty-three months after a war injury, and threatened loss of the eye, ligation of the right carotid gave a permanent cure.

Two cases of exophthalmos from fracture of the base of the skull were seen by **Argañaraz** and **Valle.** In one of the cases ligation of the carotid on one side gave temporary relief. **Gianelli** and **Ourgaud** each has written on pulsating exophthalmos. The orbital syndrome following war wounds is the subject of a paper by **Senise.**

Gomes writes that ligation of the carotid does not cure but only lessens the pulsating exophthalmos associated with arteriovenous aneurisms.

A case of aneurysmal varix of the cavernous sinus was exhibited by **Hepburn.** The common carotid had been tied, but the proptosis and murmur in the head persisted.

In stooping over **Magee's** patient, a man of 24, struck the left eye against a piece of wire. Ten days later there was pulsating exophthalmos with ptosis, immobilization of the eyeball, but still normal vision. Three months later proptosis had increased, vision was reduced and bruit was heard over the left temporal region. Pressure on the carotid had failed to give relief. The cornea was becoming hazy. The left internal carotid was ligated, causing partial right hemiplegia and fainting when the head was raised. Pulsation ceased immediately; later the noises disappeared, but the orbital edema diminished very slowly.

A woman of 43 years was seen by **Tyson** with proptosis of the left eye. Five weeks previous to the examination she had severe pain behind her right eye and on the right side of her head, and a murmur in the head which was synchronous with her pulse. The only possible cause that could be determined was strain caused by rather violent effort at singing. A diagnosis of spontaneous pulsating exophthalmos due to arteriovenous aneurysm in the cavernous sinus was made. The patient refused operation and was treated by rest, intermittent digital pressure over the carotids, and sodium iodide internally. When seen a year later, and after an interim of six months without treatment, the proptosis and murmur in the head had disappeared and the case had been cured spontaneously. There was pallor of the left optic nerve. Corrected vision of the left eye was 20/50 and the right 20/30.

Liégard presented a patient attacked with paralysis of the left oculomotor nerve, headache, vomiting, exophthalmos, bruit of the temporo-parietal region, and pulsation of the jugular. This had arisen in the course of a tumor of the base, probably giving rise to aneurysm. The eyeball did not pulsate.

A case of exophthalmos which occurred suddenly on a terminal phase of thrombosis of the jugular vein was reported by **Cordier** and **Rollet.** A case of unilateral proptosis was shown by **Goldenburg.** Its cause was not determined.

Exophthalmic Goiter.—It is pointed out by **Bram** that this term is misleading. He thinks that the disease may exist without either exophthalmos or goiter. Hysteria, neurasthenia, pulmonary tuberculosis, diabetes and simple goiter are all liable to be confused with it. In **Redfern's** experience the incidence of exophthalmic goiter was found to be less in the negro than in white persons. Exophthalmic goiter is rare in Colombia. **Montoya** reported two cases. Only one case had been reported before in the province. The author knew of only 11 cases in 16 years. The heredity of exophthalmic goiter is the subject of a paper by **Climenko.**

A case of exophthalmic goiter which followed a tonsillectomy was reported by **Rendlemann.** The thyroid gland began to swell and the eyes to protrude three or four days after the tonsils were removed.

The basal metabolism in exophthalmic goiter has been studied in a large series of cases by **Means** and **Aub,** who believe its periodic determination should be as much a routine in the management of exophthalmic goiter as the examination of the urine for sugar in diabetes melitus. They conclude that after two or three years the results of X-ray treatment are as good as those of surgery, in the majority of cases. Surgery produces a rapid fall of metabolism, followed by a secondary rise, and then a final fall. X-ray treatment causes a gradual progressive fall, and requires a lesser rest factor. Patients treated surgically do better if previously submitted to the X-ray. Surgery should be held in reserve for patients who do not do well under irradiation of thyroid and thymus glands; and it is contraindicated in cases where metabolism rises in spite of complete rest in bed.

Christie thinks that general studies of basal metabolism in exophthalmic goiter will bring a more standardized form of treatment. He mentions a case in which study of metabolism corrected the false diagnosis of exophthalmic goiter after a patient had been repeatedly advised to submit to operation. The method used at the Mayo Clinic to determine the basal metabolic rate in exophthalmic goiter was detailed by **Sandiford.** A paper has been published by **Plummer** on the blood picture in exophthalmic goiter.

In the treatment of exophthalmic goiter **Knox** says that each lateral lobe of the thyroid should be subjected to the X-ray, and also a central area including the isthmus of the gland and the region of the thymus. The filters should include 2 or 3 mm. of aluminum and secondary filter to protect the skin from over dosage. In chronic cases better results are obtained by small doses at frequent intervals. The aim of the treatment is to regulate the secretion of the glands and a small gland may be very active. The value of the X-ray and the method of its administration in the treatment of exophthalmic goiter is discussed by **Hubeny.** A fatality following the roentgen treatment of exophthalmic goiter in a woman of 35 is reported by **Secher.** Following the exposures to the rays the patient's condition was aggravated, and she died five days later. He reviews three other reported cases.

Bazett reports a case of long standing—twenty years. One lobe of the gland had been excised six years before, but the symptoms had grown much worse in the last month. The remaining lobe was found enlarged and extremely hard. Under inunctions containing mercury, iodin, belladonna and ointment of subacetate of lead, the gland rapidly softened and the symptoms disappeared within a month. A year later the gland remained perfectly soft and normal. **Sistrunk** urges that a careful study be made of the metabolic rate, and that the cases be carefully classified into medical and surgical before attempting any operative interference.

The results of exophthalmic goiter combined with myasthenia gravis in a patient observed thirteen years previously are reported by **Rennie.** After leaving the hospital the patient had gone into the country and continued taking a mixture of strychnin and belladonna, his symptoms had gradually disappeared, and at the end of a year he had been able to do light work. The symptoms of myasthenia have all disappeared and the exophthalmos practically gone. There is no ptosis, but there is still paresis of the extraocular muscles, giving rise to occasional diplopia. He can read for some time without discomfort. The pupils are medium sized and react to light and convergence. The case is interesting from the point of view of a permanence of some defect of the extraocular muscles. This might be explained by the generally accepted view that the ocular muscles are the seat of atrophy. It is noteworthy that no other muscles in the body appear to have shared in this atrophy.

The loss of both eyes following ulceration of the cornea due to exposure from the exophthalmos of hyperthyroidism was reported by **Lahey.** The goiter had been treated with X-rays and the patient's general condition improved, but the exophthalmos progressed. Removal of the sympathetic ganglion and suturing of the lids proved futile. The author believes that early surgical interference yields better results than X-ray treatment.

For extreme exophthalmos threatening the integrity of the cornea **Komoto** recommends this operation: First, canthotomy, and then with the scissors the subcutaneous division of the lower orbito-palpebral ligaments; after which it is easy to draw both lids over the cornea. The etiology, symptoms and treatment of proptosis is the subject of a paper by **Ridley.**

Hemorrhage. — Orbital hemorrhage

was observed in six out of 64 cases of scurvy in infants by **Zilva** and **Still**. There was proptosis in five cases, all limited to the eye. Zilva produced scurvy, with left sided orbital hemorrhage, experimentally in one monkey. In the second animal the hemorrhage occurred into the right orbit.

Exophthalmos with Oxycephaly.—The case reported in detail by **Dock** is particularly interesting because it occurred in a negro, and because the father (dead) had prominent eyes and a brother had orbits much altered in a characteristic oxycephalic way with exophthalmos. The patient was a female 17 years old, with bilateral exophthalmos of high degree, 30 mm. vision in the right eye 20/19 fundus normal; left counting fingers.

Orbital Inflammations.—The case reported by **Jacqueau** and **Lemoine** was extremely acute. There was double iridochoroiditis with almost complete abolition of vision and an equally violent bilateral tenonitis. The patient seemed in good general health. After some days both intraocular and extraocular inflammations began to subside and vision returned with complete restoration to normal.

A case of acute tenonitis was seen by **Dickinson.** The patient had marked chemosis of the lids and limitation of excursion of both eyes. There was tenderness on pressure. The symptoms rapidly subsided after using ice compresses, atropin, calomel and sodium salicylate.

A case of orbital cellulitis following the extraction of teeth was reported by **Dabney.** The symptoms were confusing and the possibility of a venous thrombosis was considered until the abscess ruptured and drained through the nose and the symptoms subsided. **Houwer** published a paper on thrombosis of the orbit.

Wolff presented a case of orbital abscess following influenza in a girl of 10. The nose and sinuses appeared healthy and no connection was found between them and the abscess. The pus was subperiosteal and after its evacuation healing was rapid and uneventful.

Actinomycosis.—The case presented by **Rocher** and **Jeandelize** was that of a soldier who had suffered from primary actinomycosis of the parotid. The gland had been excised and primary healing followed. Within two years, however, the tonsils, palate and pharynx became involved, the process extending into the temporal region and thence into the orbit. There was swelling of the lids with eversion of the lower and exophthalmos.

Syphilis of the Orbit.—Clinically there is no characteristic condition peculiar to orbito-cranial syphilis. It is the localization of the lesion and not its etiologic nature that determines the special features of each case. Starting from this standpoint **Charlin** discusses the clinical anatomy and diagnosis of location and etiology, and reports ten illustrative cases with a comparison of their important features. One was a gummatous meningitis of the base in the neighborhood of the optic foramena. The second had a lesion of the optic nerve near the eyeball and in the orbit near the optic canal. In another the lesion was in the region of the sphenoidal fissure. In other cases the localization was in the cranium near the orbit. The cases in which the lesions developed within the orbit were chronic or acute, and marked by varying degrees of exophthalmos, retrobulbar neuritis, obstruction of retinal circulation and motor disturbances. In six of the cases there were evidences of optic atrophy.

The case of osteoperiosteitis reported by **Le Roux** illustrates the wisdom of instituting specific treatment even with a negative Wassermann. A soldier, aged 22, denying any history of syphilis, was attacked with pain in the temple, swelling of the lids, which soon subsided in the left, but increased in the right. Incision at the tenth day yielded no pus. But the swelling continued to increase. The second incision a week later yielded pus, but a fistula remained, extending to the wall of the orbit above and 4 cm. deep. In spite of good general health and negative Wassermann he was given intravenous injections of mercury cyanide, and satisfactory healing followed.

Periosteitis of Orbit.—The case reported by **Zentmayer** was first shown as one of unilateral exophthalmos with bilateral ophthalmoplegia and neuritis, and a neurologist who saw it thought the diagnosis lay between ophthalmoplegia and thrombosis of the cavernous sinus. Later a point of redness developed in the upper lid and an incision was made along the supra orbital margin near the outer canthus. Pus was evacuated and the exophthalmos and optic neuritis subsided with restoration of the ocular movements. **Brunetiere** has reported a case of syphilitic osteoperiostitis affecting the outer wall of the orbit which simulated orbital tumor. **Cabannes** and **Duperie** have reported a case of tuberculous periostitis of the orbit.

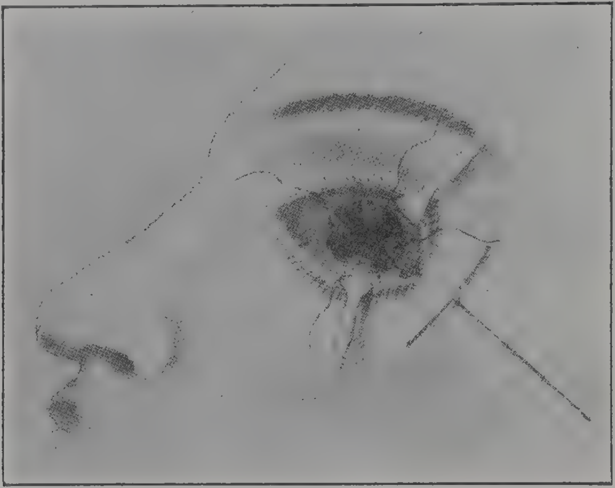

Fig. 20.—Lagrange operation of anaplerosis introducing pedicled flap of adipose tissue from temple into orbit. Eyeball enucleated, sutures placed in recti tendons, incision in temple for making a flap. (See page 265).

Sinus Disease Involving Orbit.—The discussion opened by **Spicer** at a joint meeting of the Sections on Ophthalmology and Laryngology of the Royal Society of Medicine dealt with injuries and inflammatory diseases affecting the orbit and the accessory sinuses. Cargill found nasal sinusitis a chief cause of orbital inflammation which might be retrobulbar or subperiosteal. In the acute conditions of children which followed the specific fevers early incision was urged. War injuries made by shell fire involved the sinuses. Where the wound was purely orbital practically every case made a good recovery. The essence of sinus treatment was drainage. The importance of drainage was also emphasized by Hett. In view of the importance of early union of such wounds Davis suggested draining through the nose for severe orbital cellulitis. Gillies objected to early suture because excision of all wounded tissue was not practicable for parts in and near the orbit. Among the blinded men seen at St. Dunstan's, Mollison found the frontal sinus more frequently affected than the anstrum in the proportion of 13 to 2. Where the eye was not directly injured, O'Malley found it seemed to have been caused by the missile striking the malar bone. The shock of impact being communicated to the bony wall of the orbit. Pooley found orbital cellulitis often due to extension of inflammation from the superior ethmoidal sinus, and Stuart Low spoke of the edema spreading to the canthus from inflammation of the frontal sinus.

Five cases with unilateral exophthalmos were reported by **Lynch.** Two were secondary to infection in the frontal sinus, one to a gumma of the orbit, one to a metastatic carcinoma of the orbit, and another to a chronic frontal sinus with rupture into extra-dural space, producing an extra-dural abscess and its rupture into the orbit.

Frontal mucocele in a woman aged

65 years is reported by **Becco.** The left eye was pushed outward and downward. The frontal sinus was found to be obstructed on its anterior surface at the internal third of the supraorbital arch, which necessitated the removal of a small portion of the arch. The patient made an easy recovery.

Cases were demonstrated by **Blohmke,** in which orbital phlegmon was caused by an acute nasal sinus affection, the principal cause of which was disease of the ethmoid cells. In discussion Birch-Hirschfeld stated that these cases are not primarily phlegmon, but periostitis of the orbital wall with edema of the orbital tissue in sinusitis. **Mygind** has written on acute orbital disease originating in the nasal sinuses.

In the case of mucocele of the ethmoid, reported by **Lemaitre** and **Brémond,** great assistance in diagnosis was afforded by the Roentgenogram. The ethmoid region was dark, its transverse dimension almost tripled, the left orbit clearly pushed outward, its internal wall concave inward instead of showing as a straight line. The breadth of the orbit was diminished, while its height was increased. Its section was kidney shaped rather than round shaped. In addition to the above findings the slow evolution of a lesion contributed clearly to the diagnosis. A swelling at the internal angle of the orbit had been progressive for five years. The diagnosis lay between mucocele and naso-pharyngeal fibroma. The mucocele was opened by incision at the side of the nose, drainage secured by removal of tissue and the external wound closed. Marked improvement in appearance followed.

By temporary intranasal drainage of a frontal mucocele **Morax** secured an excellent esthetic result. The tumor was opened by an incision through the eyebrow, the periosteum turned back and the sinus opened with a trephine. A perforated silver drain terminating at the upper end in a silver wire was then passed from the sinus into the nose. The wound was closed around the silver wire, and on the sixth day the drain was removed by it. There was no recurrence of the mucocele. **Sedan** has reported a case of very large fronto-orbital mucocele.

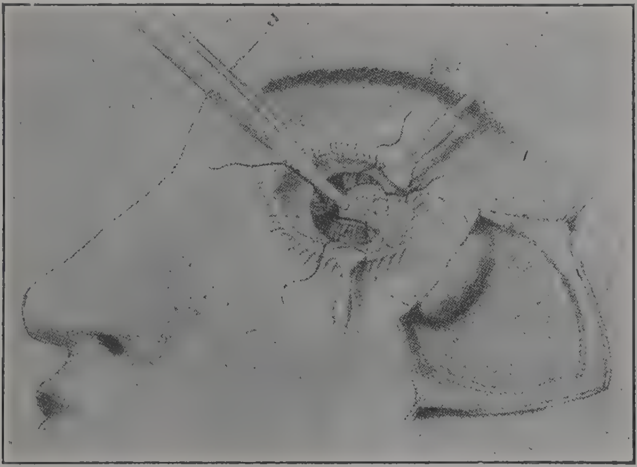

Fig. 21.—Lagrange operation of anaplerosis. Adipose tissue dissected up being pushed through tunnel into depth of orbit.

A woman of 35, with exophthalmos and failing vision of doubtful etiology, was exhibited by **Coover.** There was slight temporary improvement after exenteration of the ethmoids.

Restoration of Orbit.—Under the name of orbital anaplerosis **Lagrange** describes an operation for transplanting fat obtained from beneath the skin of the temple into the depth of the orbit while retaining its connection with its original position by a pedicle. A T-shaped incision was made near the outer canthus as shown in Fig. 20. The skin flaps are reflected. The subcutaneous fat dissected up into a flap, which is drawn and pushed into the depth of the orbit, where immediately after enucleation the recti muscles may be sutured over it. If done some time later it may be drawn and held in place by a suture passed through its apex and brought out near the nasal end of the upper lid, without making any opening into the conjunctival sac, the transfer being effected by undermining the outer canthus and conjunctiva. After the fat has been secured in place the skin of the wound is closed with interrupted sutures, the tunnel through which the flap was passed being previously sutured. **Lindgren** has written on fat transplantation into Tenon's capsule after enucleation.

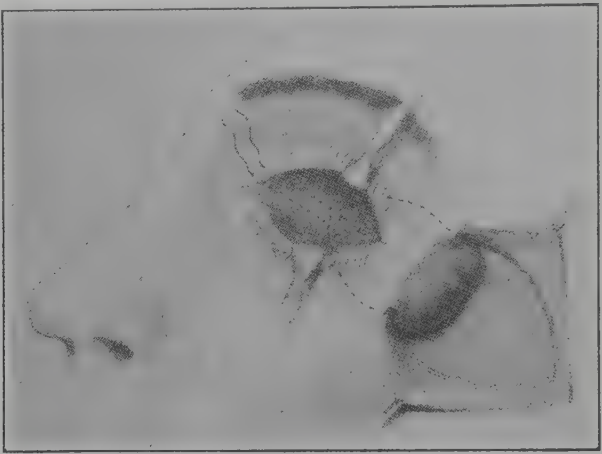

Fig. 22.—Lagrange operation of anaplerosis where socket is healed after enucleation. The tissues have been tunneled beneath the conjunctival sac and the adipose tissue is being drawn into position by a suture passed through its apex and then through the tunnel, both ends emerging above the inner canthus.

In severe burns of the conjunctiva **Wilder** urges special treatment to prevent symblepharon as soon as granulation develops to aid in the epithelization of the wound in order to prevent much of the cicatrization that will inevitably result in great deformity if not checked. Attempts should be made to cover the raw surfaces with epithelium. The difficulty of accomplishing this can be overcome by suitably prepared plates conforming to the shape of the eyeball and to the conjunctival sac, to hold the layers of the epithelium smoothly in contact with the raw surfaces; the device employed must not injure the cornea. Wilder prefers a plate made of block tin covered with hard paraffin of a melting point of 130 degrees or higher. But this alone is not sufficient; as soon as the eschar has been cast off and granulation has begun, attempts should be made to restore epithelium to the injured area by mucous membrane or thin grafts of epidermis, or when necessary by Thiersch grafts. If the loss of conjunctiva is too great to allow covering with conjunctival flaps, or the orbital socket is to be restored for prothesis, the problem is again that of lining a culdesac with epithelium. In all such operations a conforming plate must be used to hold the flap well in position, and it is best to have one or more small openings in it to allow for drainage and cleansing. To prevent the subsequent contraction the dissection should be deep, and all scarred tissue removed. The paraffin plate is usually sufficient to force the graft (which should be finer than the Thiersch grafts used for simple cases) evenly into every part of the pocket. Some form of plate, as large as possible, should be worn for several weeks. The paraffin plate irritates the new socket as little as anything the writer has used. For such restored sockets artificial eyes should be especially made, the ordinary ones make irregular pressure and tend to cause the development of scar tissue.

Cruise begins the enlargement of a contracted socket by dissecting into the orbital tissues, being careful to leave whatever remains of the conjunctiva attached to the inner surface of the lid, taking especial care to secure large enough fornix above. A mold is then made of the cavity in dental modeling wax, and on this is spread an epithelial skin taken from the inner side of the upper arm. This is placed in the cavity, the conjunctiva having been sutured to the lid and the lids are closed by sutures. After two weeks the lids are separated, the mold removed and the debris washed out. It is important to obtain every bit of conjunctiva, which serves to lubricate the surface of the artificial eye. In discussion Whittington pointed out that where the epithelial graft failed to cover the whole surface, by keeping the cavity thoroughly distended the conjunctiva grew over the uncovered parts.

Morax for complete symblepharon separates the lids, turning them and suturing their respective edges. The upper below the brow and the lower to the cheek. Then he takes a tongue-shaped pedicled flap from the adjoining temple and sutures it to form the fundus of the new orbit. After two weeks the lid margins are released and brought together over a shell or mold of lead or paraffin, leaving an opening laterally for drainage. Six weeks later the latter is closed.

In the case reported by **Coulomb** the orbital cavity was contracted to the size of a grain of corn. Under progressive dilatation it was gradually enlarged to the size of a walnut, and in fourteen months an artificial eye was introduced, giving a satisfactory prothesis. It was worn night and day till one month later was expelled by the contraction of the tissues. Dilatation was again practiced and the eye worn for about a month, when it was again expelled. A pedicled flap from the temple was then introduced, somewhat as described above, and after three months the artificial eye continued in daily use.

Jeandelize used vulcanite models of increasing size made from paraffin casts of the orbit to stretch contracted sockets. **Aubaret** and **Ferrand** have reviewed the subject of forced dilatation of the orbital cavity for atypical prothesis.

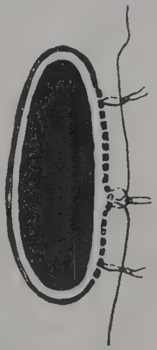

Fig 23.—Cruise's operation for contracted socket. After introducing skin graft laid upon mold of dental modeling wax and stitching lids together. Heavy black line position of skin graft. Heavy broken line remains of conjunctiva stitched to inner surface of lid. Middle stitch fastens lids together.

To overcome contraction of the lower fornix preventing the introduction of an artificial eye **Majewski** has divided the conjunctiva, carrying the incision as deep as may be desired, as shown in Fig. —. The suture is then introduced through the tissue, coming out at the junction of lower lid and cheek. When this is drawn tight the prothesis is introduced into the new formed cavity either immediately or at the first dressing.

The plastic operations on the orbit and lids performed in an Australian hospital in Egypt are mentioned by

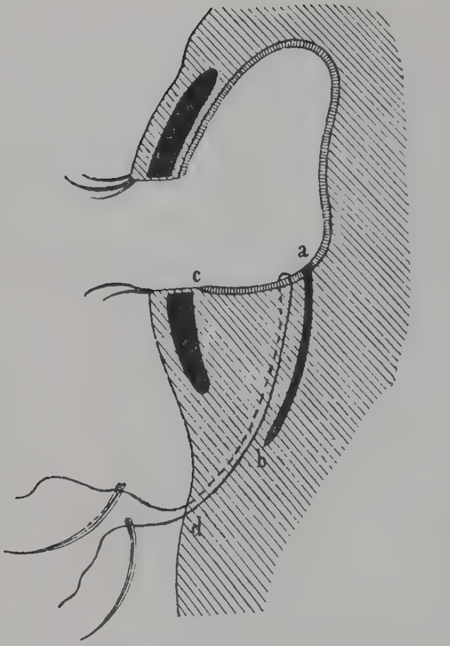

Fig. 24.—Majewski's method of forming inferior culdesac. a b Incision. Snellen suture passed through conjunctiva near a, through lower lid, emerging at d.

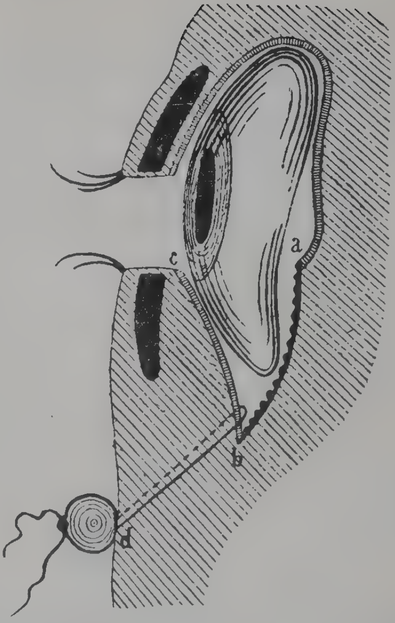

Fig. 25.—Majewski's operation for forming inferior culdesac. Suture tightened over roll of cotton at d; conjunctiva drawn to c b. Raw surface a b left to cover with epithelium, a glass shell having been introduced.

Smith. **Romulo** has written on oculo-palpebral prothesis, **Köfler** describes plastic operation done for the results of destruction of an eye, **Glauning** has discussed the changes in the orbit occurring in head injury, **Boyd** and **Gouvea** have described methods of ocular prothesis, and orbital heteroplasty is the subject of a paper by **Brunetiere.** **Poulard** has written on the inclusion of a solid sphere in the orbital cavity, having practiced a somewhat modified Mules' operation some twenty times.

Tumors

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This section covers the literature of the subject from July, 1919, to August, 1920. For previous literature, see A. J. O., v. 2, November, 1919, p. 256.

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DIGEST OF THE LITERATURE

Tumors of the Lacrimal Gland.—A case of carcinoma of the orbit in the lacrimal region was reported by **Howard.** The tumor was removed and three months later it recurred. The orbit was eviscerated and the cavity cauterized with the actual cautery. Four years later there was no indication of recurrence. The tumor evidently originated in the lacrimal gland. A bibliography of the literature on tumors of the lacrimal gland accompanies this article.

A tumor the size of an orange was removed from the left orbit by **Brandes.** The eye, which had been pushed downward and was lying on the cheek, was replaced in the orbit and held in place by a pressure bandage. In six weeks the function of the eye had returned to normal. Van Duyse examined the tumor and pronounced it chondroepithelioma of the lacrimal gland (mixed tumor), with the epithelial elements predominating.

A patient from whom a sarcoma of the lacrimal gland was removed five years previously was reported on by **Alger.** So far there has been no recurrence. The growth had been noted four years before, caused the characteristic displacement of the eyeball, and was easily palpable. The growth was enclosed in a thin capsule which ruptured upon removal. Both the gland and its accessory were removed. The case is interesting because of the long period with no recurrence in spite of rupture of the capsule, and also because it illustrates how comfortable an eye can be without any lacrimal gland. The case bears out the contention that adenosarcoma of this type has a very low malignancy offering a relatively good prognosis. **Kuboki** and also **Fusita** write on tumors of the lacrimal gland. **Cunningham**'s patient had an endothelioma of the lacrimal gland, which produced proptosis downward and forward.

Tumors of the Lids.—A patient with growths on the inner surface of each eyelid was presented by **Fagin.** Sections of the tumor were examined by Finnoff, who concluded the growths should be classified as lymphomas. Jackson believed that large doses of radium, say thirty or forty millicuries were indicated. Black believed, outside of radium, fulguration should be tried; this failing, he would be in favor of letting the case alone. **Poyales** discusses the subject of congenital dermoid of upper lid. **Komoto** makes a contribution to adenoma of Meibomian glands.

Paton discusses cyst of Krause's glands in a man aged 32. The patient gave a history of having been operated on for a Meibomian cyst. The right upper lid showed a scar over a swelling about the size of a sparrow's egg. On eversion of the lid the swelling was shown to be due to the presence of a large translucent oval cyst lying above the upper margin of the tarsal plate, 20 mm. horizontally and 10 mm. in diameter. Pathologic examination confirmed cyst of Krause's glands.

McAll states there are seen from time to time in Central China patients whose eyesight is obstructed, entirely or partly, by the formation of tumorlike masses which grow between the eyeball and the lid. There is no conjunctivitis or other acute inflammation. The growths are painless, they do not ulcerate on the surface or break down in the center, but remain firm throughout. They gradually involve the eyelids, producing great thickening, which finally causes the mechanical occlusion of the palpebral aperture. The writer has seen about a dozen cases of this rare form of conjunctival granuloma. The patient varied in age from 15 to 40 years, the majority being men. One or both eyes may be involved, the duration of the case ranging between one and a half and nine years. Sections of the tumor show that the bulk of the growth is composed of round cells (lymphocytes) which infiltrate the normal tissue. The periphery of the growth is vascular, the cells in the center show no sign of breaking down.

Malignant Tumors of the Lids.—Gallemaerts observed a melanosarcoma of the lid in a woman aged 81 years. Twenty years previously a grey spot had appeared on the left cheek, malar region, which had gradually increased in size, becoming meanwhile brown and then black. About the same time a similar spot appeared on the nose, and about a year ago a third spot appeared on the upper lid, which in the last 3 months developed into a tumor. Operation was refused.

An epithelioma of the lid was completely cured by **Mawas** and **Lomon** with three applications of the X-ray, although the growth was without doubt of ulcerous epitheliomatous nature.

Beck contributes to the subject of carcinoma of the upper lid. Seven illustrations accompany the report. A man aged 50 years had suffered the preceding six months with a gradually increasing growth of the upper lid. Syphilis or tuberculosis was suspected. Microscopic examination revealed an epithelial growth. X-ray and surgical intervention were the two methods of treatment considered. Considering the neighborhood of an absolutely normal eye, X-ray seemed to the author risky. Surgical measures were resorted to. The growth, together with the border of the eyelids excluding the eyelashes, were removed. The denuded area was filled by a flap from the temporal frontal region. Very satisfactory results were obtained.

Roy observed two cases of epithelioma of the eyeball and lids. The first, a male, aged 54 years, noticed six years previously, and during the interval up to the present, inflammatory exacerbations in the left eye. At the time of examination there was present an elevated gelatinous mass which resembled those seen in severe vernal conjunctivitis. It was situated at the lower nasal sclero-corneal margin. There were numerous radiating blood vessels going to the mass. The whole sclera was congested. Vision was 20/50. The growth was thoroughly removed, but as a considerable irritation persisted radium was used for several months without any material results. Eight months later the growth recurred and the eye was enucleated. Two weeks later a piece of the remaining conjunctiva showing epitheliomatous changes, exenteration was done. There has been no recurrence in eleven years. Roy's second case was in a female, aged 33 years, who had been treated by various means for several months by a dermatologist. On the dermal side of the lower lid was a large, scaly ulceration. On the mucous surface were old cicatricial adhesions to the eyeball. The globe was red, irritated and painful. Exenteration was performed and the orbit swabbed with chloride of zinc. A remaining moist point was treated with X-ray. There has been no recurrence in six years.

The epithelial origin of a malignant pigmented nevus was proven after histologic examination of sections taken from a tumor which was removed by **Marongiu.** The patient, a man 42 years of age, had always had a small pigmented nevus in the lower right eyelid. It had been slowly increasing in size and when first seen by Marongiu it occupied the inner 2/3 of the lower lid, was dark in color and covered by a crust. A submaxillary gland on the right side had also enlarged.

The tumor and gland were removed. Two months later there was a recurrence of the pigmented tumor in the lids and caruncle. The patient subsequently had metastasis of the tumor in the internal organs and died of cachexia. Miscroscopically the tumor was found to be composed of pigmented epithelial cells arranged similarly to those found in a basal cell epithelioma. The pigment granules were both intra and extra cellular. After careful study the tumor cells were found to be transformed cells of the epidermis of the skin with which they were closely associated. In the author's opinion the tumor was a neuro-carcinoma of epithelial origin of the same type as those described by Unna. Cystic epithelioma of the lid is reported by **Oblath.**

Benign Tumors of the Conjunctiva.—Congenital cyst of the bulbar conjunctiva in a child aged two months was observed by **Gallemaerts.** The growth was a small white tumor of the right eye. It was movable and not injected. It was excised and examined microscopically. It was a serous cyst, with granular contents, from debris of nuclei, which stained poorly. The cyst was enclosed in mucus tissue, and presented a delicate outer layer of cells with fusiform nuclei. This layer was covered by an epithelium of cylindrical cells with large nuclei, and this by cilia. Between the bases of the cylindric cells cubic cells were found.

A child one week old with a nevus at the internal canthus was shown by **Krebs.**

Maxted observed a pedunculated hemangioma of the conjunctiva. It was about the size of a pea, growing from the surface of the palpebral conjunctiva and the lid margin. For three months previous to coming under observation, the patient complained of occasional bleeding from the lids. Sections showed a collection of capillaries with a small amount of connective tissue.

Cabannes and **Duperie** describe a subconjunctival fibrolipoma. The growth was removed from the outer portion of the inferior culdesac from an apparently normal woman, aged 29 years. The tumor was first seen two months previous to its removal.

Mine observed a patient who had a reddish-white thickening of the conjunctiva of the lid which extended to the fornix. The surface was uneven and resembled a papilloma. Sections of the growth showed plasma cells richly scattered between connective tissue cells, which established the diagnosis of plasmoma.

Hepburn presented a case of papilloma of the conjunctiva in a boy aged 8½ years. The condition was first seen a year before and had been treated with the diathermic cautery. Six applications, lasting less than a minute, had been employed. Some improvement occurred under this treatment. However, a few months later he returned. The growth had increased and involved the whole lower lid and extended deeply into the skin of the cheek down to the level of the malar bone; the upper lid was also involved over its whole extent. Surgical treatment was necessary and exenteration was done.

A girl 10 years of age, with a papilloma at the limbus, was treated by **Jacovides.** The tumor was 1½ cm. in its greatest diameter, and originated from the epithelium of the cornea and conjunctiva on the nasal side. The patient was also a victim of an extensive xeroderma pigmentosa. The tumor was removed and diagnosed a papilloma by the pathologist.

Gonzalez reports a case in which an extensive pterygium had returned five times after operative removal, and enucleation of the eye was being considered on account of fear of a malignant nature. He severed the large vessels nourishing the pterygium, an actual peritomy, and injected into the center of the pterygium 3 or 4 drops of a 3 per cent solution of a preparation of thiosinamin. In the course of forty days nine injections were thus made at different points in the pterygium, increasing the strength from 3 to 10 per cent, as it atrophied. The retrogression was complete, but the relics of the five operations are irreparable, although the visual field has become larger and the movability of the eye greater. There has been no trace of recurrence during the months since.

Epithelioma of the Conjunctiva.—A man, aged 84 years, had an epithelioma confined to the bulbar conjunctiva near the nasal side of the limbus. **MacLeod** removed the tumor and covered the denuded area with a conjunctival flap. There had been no recurrence after two years.

Veasey reports a case in which there was such a growth larger than a good sized English walnut. A male, aged 56 years, gave a history of a small reddish spot having existed since childhood. This spot began to rapidly increase in size three years previous to observation. The fungating neoplasm measured 3 c. m. in diameter. Sections appeared mainly as papilloma. There were no prickle cells or pearly bodies, but about the borders occurred distinct penetrating cords and groups of cell masses, islets and lines of epithelium, indicating essentially a malignant growth.

Sarcoma of the Conjunctiva.—**Gallemaerts** describes a case of melanosarcoma of the conjunctiva in a woman aged 54 years. The tumor was in the left eye, starting at the corneoscleral margin, 15x8 mm., and projected outwards between the lids. There was no difficulty in removing it. Microscopically the tumor was found to be a melanosarcoma. It had developed on the site of a congenital pigment spot. There was no history of an antecedent trauma. Illustrations accompany the paper.

Satanowsky's patient had a melanotic sarcoma which had grown from the conjunctiva of the upper lid. It was successfully removed by Cisnero's electro-coagulo-ignition method, charring a circle of tissue all around the tumor and thus preventing hemorrhage. There were several papillomas on both the upper and the lower lids, and all were burned off by this same method. The sarcoma had developed to a size of 10 by 13 mm. in less than a month after it had first been discovered.

A woman 61 years of age consulted **Roemer** because of a swelling of the lower lid of the left eye, which had been increasing in size for a year and a half. The tumor was the size of a pigeon egg and was attached by a large pedicle to the inferior cul-de-sac. By everting the lower lid, the tumor could be forced up over its margin and between the lids. The mass was thoroughly removed under a local anesthetic. After microscopic examination the tumor was diagnosed as melano-sarcoma. Three illustrations accompany the article.

Collins' patient with an epibulbar sarcoma was a female, aged 34 years. A growth had previously been removed by Cresswell, but recurred in three months' time. The mass was lobulated and pigmented and sprang from the conjunctiva at the outer margin of the cornea by a base which occupied about one-fourth of its circumference on the temporal side. The growth fungated out, apparently overlapping, but not invading the cornea. The growth was removed as completely as possible, after which radium was applied. At first a flat applicator containing 7 mgrm. was applied without screen for 30 minutes. Six months later all that remained was a light brown discolored area on the sclera. The growth was a sarcoma, the spindle cells predominating.

Tumors of the Cornea.—A very excellent paper on granuloma of the cornea is contributed by **Feingold.** He records case histories with histologic studies and illustrations, followed by a general discussion of the subject and a full bibliography. The author refers to the absence of reference to this subject in modern text-books. The first patient was a colored man, aged 56 years, who had received a burn with muriatic acid. There were two granulomata, one on the conjunctiva at the lower, and the second one at the upper temporal limbus. Later the upper granuloma moved to the center. The second patient was a farmer, aged 42 years. The growth resulted from a burn with unslacked lime. The granuloma was situated on the cornea just below the center. Repeated attacks of pain caused the sacrifice of the eye.

Among many of the histologic findings in the affected area, the lamellae have lost their parallel arrangement, have changed direction and have a tendency to bend forward into the pedicle. Between the separated lamellae and surrounding the blood vessels, numerous cells of the following types are found: (1) cells, each with a large, pale vesicular nucleus that is often smaller and distorted by the surrounding tissue; (2) plasma cells; (3) polymorphonuclear leucocytes; (4) occasional eosinophylic leucocytes; (5) small, round cells, apparently lymphocytes; (6) cells in mitosis, most probably of the type mentioned in group 1. The character and arrangement of the cells varies from place to place. Here the plasma cells prevail, there the polymorphonuclear leukocytes, etc.

Types of granulomas the author classifies as follows: The formation of granuloma tissues as the result of tuberculosis and leprosy undoubtedly belong to a different class. For practical reasons it is advisable to divide pure granulomas of the cornea into the following three groups:

1. Granuloma in the region of the cornea, the result of a prolapse of the iris following perforation; this might properly be called granuloma of the pseudocornea.
2. Granuloma of the cornea extending from the conjunctiva of the eyeball near the limbus after injuries, etc.; granuloma of the sclerocornea.
3. Granuloma of the cornea, developing away from the limbus and not the result of perforation; granuloma of the cornea proper.

In connection with the question of etiology, one will have to consider two points: (1) Under what condition does granuloma arise in tissues and especially in the cornea? (2) why does the destruction of corneal substance not lead to any secondary infection, but only to the formation of granulomas?

In the treatment of these cases it will be good to bear in mind the continued danger of infection and, therefore to limit one's self to as little manipulation as possible. Abscission of the granuloma may not be advisable in view of the several reports of their recurrence, and especially so because such action may open an avenue for infection. It is best to await the absorption of the granuloma in consequence of the scar formation and the accompanying reduction of the blood supply.

Gallemaerts' case of dermoid of the cornea and subconjunctival lipoma occurred in a man aged 37 years. On the cornea there was a dermoid 6 mm. in height and the same in extent. Continuous with this growth was a lipoma in the subconjunctival tissue at the outer canthus. **Komoto** discusses the subject of papilloma of cornea, reporting the first case placed on record from Japan. It sprang from the inferior limbus and lower half of the cornea and presented the typical structure of papilloma.

Tumors of the Limbus.—Zentmayer contributes a noteworthy case report of a patient with multiple dermoids of the eyeball with other anomalies. The patient, a female aged 32 years, single, was observed in the author's service at Wills Hospital. The face is of a masculine type and its conformity is irregular. The forehead is large, the nose is awry, the fissure of the mouth extends on the left side half way to the ear lobe, the angle being deflected downward. In advance of the lobe of each ear there is a supernumerary tragus. On the right side this consists of a serrated fin of cartilage and skin. On the left side the mass is bilobed and there is a small fistula posterior to it, probably an incomplete supernumerary external auditory canal.

In the right eye, overlying the sclerocorneal margin below, there is a growth measuring about 5x8 mm. and having an elevation of about 3 mm. The axis of the mass is 15; one-half is upon the sclera and one-half upon the cornea. It has a pultaceous feel and is of chamois color. A second smaller growth springs from the surface of the cornea near its summit. It is somewhat conical in shape and leukomatous in appearance. It measures approximately 4x6 mm. and has an elevation of 3 mm. There is a narrow zone of opacity in the cornea about the base of the growth, extending to within 1 mm. of the limbus, from 60 above to 105 below. The corneal tissue is clear over a narrowing band extending around the lower and inner margin of the growth. There is a very shallow notch in the margin of the upper lid, in a position corresponding to the apex of the corneal tumor. This also is a congenital condition. In the left eye there is a sclerocorneal dermoid almost symmetric with that in the right eye. Both marginal growths had well-developed white hairs, growing from their surface. All three dermoids were removed, the right external rectus was advanced, the internal and superior recti were tenotomized, the supernumerary tragi were removed, and the left macrostomia was corrected by denuding the mucous membrane and removing some of the fibers of the orbicularis oris. Microscopic examination of the specimens showed dermoid growths.

Bywater and **Gorst** observed a very large corneoscleral cyst, which was situated in the upper half of the right eye extending across almost the whole length of the palpebral aperture, causing very marked lagophthalmos. The condition was in a boy aged 9 years who received an injury three years previous. The growth measured 25x12 mm. The upper lid barely covered the cyst. There was no ulceration. There was no anterior chamber and no pupil visible. Tension +3. Sections from the removed eye are illustrated.

Pearce saw a patient with a growth almost completely covering the cornea consisting of a peculiar leathery epithelial proliferation. There was a history of repeated operations for the removal of recurrent pterygium. **Campos** discusses ocular dermoids. **Jacovides** papilloma of the limbus in Kaposi's disease.

Cysts of Iris.—In an editorial in the Medical Record cysts of the iris are discussed. The symptoms usually appear a long time after a trauma. Its growth is in direct relation to the symptoms of irritation. The eye frequently adapts itself quite well to the cyst, but occasionally, when the tumor continues to grow, there may be a certain amount of intolerance. They appear as small, smooth rounded tumors, occasionally bilobate or multilobate. They may be serous or pearly and are benign. Following complete extirpation there is no recurrence. This should be done during the absence of inflammatory phenomena.

Jamamoto observed the development of a cyst of the iris after a strabismus operation, although the sclera was not perforated. However, he suspected a slight injury which was not noticed. The epithelial cells which eventually entered probably grew from the surface of the iris along the crypts into deeper tissue and thus gave rise to the formation of the cyst. It was extirpated, but histologically showed nothing remarkable.

Sarcoma of Iris.—At a meeting of the Section of Ophthalmology of the New York Academy of Medicine, **Alger** presented a woman, aged 50 years, with a sarcoma of the iris and the ciliary body. It was first noted as a pigmented spot some two years before. The growth apparently sprang from the root of the iris, was about 5 mm. in diameter, and projected forward almost to the cornea. The tension of the eye was slightly raised. Half way between the limbus and the insertion of the internus were several small points of black pigment indicating impending perforation of the sclera. The patient had a mass, possibly malignant, in her liver. The question was as to the advisability of removing an eye, which was not troublesome in any way and had fair vision, in view of the liver condition. Removal of the eye was the consensus of opinion of those present.

The rarity of primary sarcoma of the iris is commented on by **Fage**. The author quotes some of the literature on the subject and reports a case which he observed in a woman 36 years of age. When the patient was first seen a small, flat, yellowish nodule was observed at the base of the iris. No signs of irritation were present, and the tension was normal.

The patient was seen three months later, at which time she complained of severe pain; the eye was red, the aqueous slightly turbid, pupil contracted and tension increased. The mass had grown very perceptibly and obliterated the angle of the anterior chamber below; vision hand movements. The eye was enucleated and examined histologically. The mass originated from the iris stroma and in the involved portion of the iris extended from the pupillary portion to its base. The tumor was a sarcoma.

Cyst of Ciliary Body.—Lloyd reports a phantom intraocular tumor, a multilocular cyst of iris and ciliary body. A man, aged 51 years, complained of failing vision during the preceding three months. Examination showed a vision of fingers at two feet. Through a dilated pupil there were observed pigment flecks on the anterior surface of the lens and a cortical cataract located near the posterior pole. The nasal portion of the iris was pushed forward, and by looking down and in, through the pupil, one could see a light-colored mass, located between the iris and the lens, and a narrow band leading backward to a dark-colored mass, which was posterior to the lens and evidently on the inner surface of the ciliary body. The masses appeared as made of several smaller masses. In transillumination there was no interference with light transmission. The tension under mydriasis was 16 mm.; without, it was 12-13 mm. An iridectomy was performed followed by considerable hemorrhage. After the chamber cleared, nothing of the former mass was to be seen, nor did the section removed from the iris appear abnormal. Sections showed the epithelial layer of the iris posterior surface detached, which may or may not be pathologic. The layer was very much reduplicated, contained pockets and was in excess of the amount necessary to properly cover the surface allotted. Without doubt this layer had been ballooned by fluid. The contribution presents one illustration.

Sarcoma of Ciliary Body.—Thompson reports a case of mixed cell sarcoma of the ciliary body practically free from pigment. A woman, aged 44 years, first experienced visual disturbances in the right eye in 1915. When seen three weeks later the eye showed absolute glaucoma with cataractous lens, and was enucleated. A light grey mass, the thickness of a small pencil and slightly flattened behind the iris, took origin from a definite point in the ciliary body. The other end of the cylindric mass was free in the vitreous. The ciliary body was not infiltrated by the sarcoma, nor had any other tissue of the eye seemed affected, except by the glaucoma. **Feder** reports on sarcoma of ciliary body; and **Demaria** writes on glioma of ciliary processes.

Tumors of the Choroid.—A subretinal exudate resembling sarcoma of choroid was observed by **Knapp.** The patient, a male, aged 71 years, presented a sharply defined mass in the macular region, dull white in color, with some mottling, with an elevation of 3 D. In the absence of inflammatory or vascular changes in the eyeground, the diagnosis of sarcoma of the choroid was made and the eye enucleated. The microscopic examination showed a subretinal mass of organized connective tissue between the choroid and retina. The choroidal and retinal vessels were normal. The case chiefly resembled the type described by Coats as retinitis with massive exudation, except that the swelling occurred in the macular region in a patient of advanced age and with no vascular changes. The other eye subsequently developed central chorioretinal changes, consisting in deep retinal hemorrhages, pigmentation, atrophy of retina, superficial atrophy of choroid, and changes in the choroidal vessels.

Diagnosis of Intraocular Tumors.—Lindahl describes, in detail, the methods of transillumination for the diagnosis of tumors of the choroid. Accompanying the contribution are many illustrations and colored plates. The author describes his own method of pupillary transillumination of the sclera in which he uses a Nernst light patterned after that of Gullstrand. The lamp gives a very small but concentrated pencil of light. In using it, the eye is turned toward the lamp, the light directed through the pupil illuminating the sclera opposite from the inside. A detailed account of the appearance of the normal sclera, ciliary region, is given. The presence of a tumor is shown by a dark area in the illuminated field. Tumors are much more readily seen than by other methods of transillumination. The lamp can also be used for ordinary transillumination to better advantage than the old lamps on account of its stronger light. In suspected tumors of the posterior half of the eyeball he uses in addition two procedures: (1) The method of Gullstrand using his light and an ordinary Morton ophthalmoscope. (2) Illuminating the eye through the sclera with the author's light and observing the suspected area through the pupil with the ophthalmoscope. In a serous detachment of the retina, the detachment will appear red with dark vessels. If, on the other hand, the area, or a part of it, appears dark there is present a tumor or blood back of the retina. These two methods will always give positive findings for a posterior tumor, provided that the tumor touches or lies close to the retina at any place which can be observed through the pupil.

The clinical and pathologic report of a case of intraocular tumor is contributed by **Hansell.** The practical question intimately connected with the determination of the diagnosis is the line of treatment to be adopted in an individual case. Rarely may the growth before enucleation be declared malignant. The exceptions are those cases which are rapidly growing, with ruptured ball, and extension to neighboring tissues. It is in the early stages, when enucleation may prevent metastasis, that the diagnosis is most important. The ocular conditions which interest us in this stage are: First, Separation of the Retina—Our first thought in the presence of retinal detachment, in which high myopia or traumatism have no causative influence, is of choroidal sarcoma. Close observation of the course of the detachment extending, if possible, over several weeks or even months, and including frequent measurements of the visual field, is most helpful. A gradually increasing area of blindness almost positively indicates tumor, whereas extensive fluctuations or an unchanged area point to other causes. Second, Intraocular Tension—Difference of opinion prevails as to the diagnostic value of this sign. It may be assumed that until the lens is pushed forward, the anterior chamber shallowed, the iris dilated and unresponsive—in other words, the glaucomatous stage—the tension is normal, or nearly normal. It is true that the intraocular contents are increased by the extraneous tissue, at least in number; but that there is actual or permanent increase in tension by this new tissue is subject to question. Third, Transillumination—In making use of the transilluminator the room should be dark and the observer must critically study the pupillary reflex from every direction. The test is of great diagnostic value only in those cases in which the tumor lies in the anterior half of the ball. The author relates the case history of a female, aged 39 years, who had been under observation for six months. The eye was free from pain and injection until one week before enucleation. Histological examination of the specimen showed the growth to be a melanotic sarcoma.

Friedenwald, clinically and histologically, described two cases with ophthalmoscopic conditions simulating sarcoma of the choroid, which indicated the difficulty, or even the impossibility, of making a definite diagnosis in some cases of neoplasm of the fundus solely on ophthalmoscopic appearances. One was a granuloma of the choroid of obscure origin. Tubercular origin of the growth could not be excluded, although tubercle bacilli had not been found, in spite of the most careful examinations by competent pathologists. In the second case, in a boy aged 12, the negative Wassermann and negative von Pirquet reactions excluded a luetic affection or solitary tubercle. There was nothing in any part of the mass to suggest a neoplasm, and the picture was typically that of an inflammatory round-celled exudate undergoing organization. It was regarded as retinitis with massive exudation.

A patient with a small tumor in the macular region was observed by **Castelain.** The man, aged 37 years, had a scotoma of about 5° when first seen. During the period of observation a small hemorrhage occurred and increased the scotoma to a diameter of

30° Syphilis, tuberculosis and parasites were eliminated as causes. The eye was not enucleated.

Moore exhibited a case of melanoma of the choroid, which had remained stationary for four or five years. It showed the characteristic "blue ointment" color which was uniformly distributed over the growth. It was only discovered on routine ocular examination. The pigment appeared to be intracellular.

Sarcoma of the Choroid.—A boy, aged 14 years, observed by **Paton** and **Collins** presented a large nevus on the left cheek and temporal side of the orbit, detachment of retina outwards and downwards. Tension normal. Puncture of the sclera as made with the galvanocautery, but vision did not improve. A year later an acute attack of glaucoma occurred, and the eye was removed. A lens-shaped mass in the choroid, 9 mm. long and 5 mm. wide, extended from the upper margin of the optic disc to a little behind the equator. There were the typical appearances of caverous angioma. In the partitions between the vascular spaces on its inner surface were well developed lamellae of bone.

A minute sarcoma was reported by **Weeks.** The author recognized a small swelling in the macular region and made drawings of it, paying particular attention to its relation to the blood vessels. The mass was observed for four months and a steady increase in its size was noted. The eyeball was enucleated and a tumor measuring 2 mm. in its vertical and 1.5 mm. in its horizontal meridian was found slightly above the macular region. It was 0.5 mm. in thickness. Sections of the tumor showed it to be composed of spindle-shaped cells, some of which were pigmented, and chromatophores, which were apparently derived from the pigmented epithelial cells of the retina. The unusual features of the tumor were its proximity to the pigment epithelium and apparent absence in the outer layers of the choroid, and the presence of chromatophores, which were apparently derived from the retinal pigment epithelium.

Charles observed in a man, aged 24 years, a growth which had perforated the sclera in the lower inner quadrant. The patient affirmed it had been present at least eighteen months. Wassermann was negative. One day following an injection of three milligrams of O. T. there was a pronounced local and general reaction. A general physical examination showed no evidence of tuberculosis. Owing to the slowness of the growth and the patient's refusal to permit enucleation, a tentative diagnosis of a perforating solitary tubercle was made. Tuberculin injections were begun with small increasing doses, adminstered weekly. Following the first dose there was a mild local reaction. This was continued for six weeks, at which time 10 mg. were administered. Twenty-four hours later the growth was much redder, with lacrimation, and its apparent dimensions were 1¾x1½x ½ cm. There was no doubt about a focal reaction.

The eye was removed, microscopic sections showed a spindle-cell sarcoma. The author's comment is that a positive focal tuberculin reaction in a tumor originating in the uveal tract is explainable by considering the vascular supply of the growth. Evidently this patient had a uveal tuberculosis which gave a positive reaction, which for our purpose means a congestion in the uvea that simply extended to the tumor. Strictly speaking, then, the tumor itself was not positive to tuberculin, but only the tissue from which it derived its blood vessels.

Bentzen did an exenteration of the orbit for sarcoma of the choroid. The patient came with an acute glaucoma in the right eye of two days' duration. Previous to that he had had a gradual loss of vision for ten years, with blindness during the last two years. Enucleation was done on September 18, 1915. The eye was found half filled with sarcomatous tissue. Three weeks later the orbit was exenterated and cross section of the optic nerve showed tumor cells among the nerve fibers, but the sheath was intact. At present the man is well and no recurrence has taken place.

Veasey reports two cases of melanotic sarcoma of the choroid. The first was in a man aged 41 years who had lost his vision in the right eye at least one year previous to coming under observation. The left eye showed distinct and marked symptoms of irritation and had a vision of 6/15. Following the removal of the right eye the left entirely cleared up. The second case was in a woman aged 60 years. The eye was in the glaucomatous stage. No ophthalmoscopic examination could be made. The first showed no interference to transillumination owing to its position in the posterior pole of the eye. The second showed interference with transillumination.

A patient from whom the eyeball was removed because of sarcoma of the choroid was seen again 28 years after the operation by **Hirschberg.** There was no evidence of recurrence. The author believes that this is the oldest case of its kind on record.

Smith, Commes and **Ceelan** each contribute to the literature of sarcoma of the choroid.

Lossen makes a contribution to trauma and malignant tumors.

Carcinoma of Choroid.—McBean removed an eye having had several glaucomatous attacks accompanied with sub-conjunctival hemorrhage. Sections showed a flat tumor of the choroid. A few weeks later the fellow eye showed a tumor which almost filled in the interior of the globe. The patient died of general carcinosis two years after the original ocular metastasis. The patient, a woman, aged 52 years, had had both breasts removed for carcinoma prior to coming under observation for her eyes.

Glioma of the Retina.—Schoenberg reports a case of bilateral glioma of the retina apparently arrested in the non-enucleated eye by radium treatment. The author enucleated the left eye of a child, aged 2 years, with clinical evidence of glioma, which was subsequently confirmed microscopically. While the child was under the influence of the anesthetic the right eye was examined. A sharply circumscribed grayish white tumor was found limited above and below by branches of the retinal artery, occupying an area a little larger than a quadrant of the eyeground, extending from the margin of the disk nasally and below, towards the periphery, but not reaching the latter. This area was surrounded on all sides by patches of choroidal atrophy with pigmented borders. In its central portion were two small spots of gliomatous degeneration, above and over to the periphery was another small grayish mass occupying an area of about 4-6 disk diameters. Three treatments with radium were given at intervals of several months by Janeway. At the last examination, three years later, the impression is gained that all that was left of the glioma is a degenerated necrosed mass.

The patient presented a number of features worth pointing out: (1) The length of time under observation (over three years). (2) The microscopic evidence as to the correctness of diagnosis. (3) The chorioretinal patches surrounding the growth. (4) The lenticular changes during the treatment. (5) The good vision and general condition, and the absence of increase of tension three years after the glioma had been discovered and treated. (6) The apparent arrest, recession and degeneration of the gliomatous masses. The report on the final outcome of this case will be made in due time.

Maghy had the unusual experience of observing a case of bilateral glioma of the retina in a girl, aged 20 years, in which the second eye was excised after an interval of nearly 18 years. The first eye was removed when the patient was a baby. Examination of the globe showed an exophytic growth springing almost entirely from the inner nuclear layer. An opaque lens was removed from the second eye following which there was a persistent increased tension. The excised eye showed upon microscopic examination a glioma. The only case history found by the author, in which so great a time elapsed before the involvement of the second eye, was 17 years.

Because of its ectodermal origin, **Monauni** prefers to classify glioma of the retina as a neuro-epithelioma. **Fischer** adopts the term neuroblastoma.

Metastatic Sarcoma of Retina.—The case history of a woman aged 49 years with primary melanosarcoma in the right eye with multiple metastases, including one on the left eye, is reported by **Doesschate.** In a second case, a woman aged 50, a pigmented nevus below the right breast became transformed into a sarcoma, and was excised in 1914. In 1917 metastases developed in the brain and skin; and in the uvea of one eye and in the retina of the other eye, but the papilla escaped. He does not know of any record of similar metastases in the retina from a tumor elsewhere. A few cases are cited as metastases in the eye from sarcomatous degeneration of a nevus on the cheek, parotid region, etc., but none were on the retina. Primary sarcoma in both eyes has been reported by Fuchs and five or six other writers.

Tumors of the Optic Nerve.—An unusual case of optic nerve tumor was shown by **Carruthers**. The patient, aged 21 years, was not aware of anything wrong with his vision until he was aged 14 years. His attention was drawn to his eyes by increasing dimness of sight of one. As his other eye was good (6/6) he paid no attention to it. He later had dragging pain at the back of the eye, as last June he attended the Herbert Hospital for treatment. A consultation was held, and operative measures were discouraged. The man returned to work, but came again in July, and then the eye was found to be quite blind; and the pupil did not react directly to light, only consensually with the other. There had been no pain, no injection of the conjunctiva, and the media were clear. In July there was a pearly-white organized mass, covering the whole anterior surface of the optic nerve; no hemorrhages nor even vessels were apparent in it. There appeared a retinochoroidal rupture; and the structures inside a pigmented ring were evidently being drawn towards the undersurface of the tumor.

Pockley reported two cases in which he had performed Krönlein's operation, one for removal of bullet from the orbit. The second case was of a young girl with a previous history of blindness and marked proptosis. At the operation he found a fibrosarcoma of the optic nerve. He removed it as far back as the optic foramen. The proptosis was much reduced, but there was still some ptosis.

In an editorial in the Medical Record, hematomas of the optic nerve sheath are discussed. From an etiologic viewpoint they may succeed either a cranial traumatism accompanied by gradual hemorrhage, or spontaneous hemorrhage. Some writers describe a primary spontaneous hematoma. The origin of the hemorrhage is usually one of the vessels of either the pia mater or the brain. But it may also come from the middle menningeal. Some are of the opinion that fracture of the optic canal is a necessary condition. The hematoma being usually bilateral, it is difficult to conceive that in all cases there should be fracture of both optic canals. Primary hematoma is unquestionably rare. There is at least one authentic case, the specimen being in the ophthalmologic clinic of the University of Lyons. **Dahms** discusses retrobular tumor, and **Garcia Mansilla** sarcoma of the optic nerve.

Tumors of the Orbit.—**Hough** showed a child, aged 1 year, who, since the second month, had presented a small but gradually increasing orbital tumor. This was situated at the juncture of the frontal ethmoid suture, and was about 6 mm. long and 3 mm. wide. At first it was of bony consistency, immovable and with no signs of inflammation. Recently the mass had increased at least a third in size, and become cystic in character. The points of interest were the early hardness, the very slow growth, and the later sudden change in character and rapidity of increase. **Rousseau** reports on cysts of the orbit. **Speciale-Cirincione** (See Digest of Lit. A. J. O., V. 1, P. 192) reviews the treatment of endorbital osteomata, giving nine illustrations from three cases.

A woman 23 years of age with protrusion of the right eye forward and downward was operated by **Stieren.** An incision was made, beginning at the upper rim of the orbit and extended downward to the external angle of the orbit. A smooth, encapsulated growth, which had dislocated the lacrimal gland from its fossa, was found under the roof of the orbit. The tumor and major lacrimal gland were removed. The cosmetic result was perfect. The tumor contained caseous material and hairs and was diagnosed a dermoid cyst.

Spencer and **LaRue** observed a man, aged 43 years, with an extreme proptosis. On account of a slight pulsation, and of the presence of varicose veins, a diagnosis of probable pulsating exophthalmos was made. The patient was next seen three years later. The exophthalmos had increased. There was rather severe constant pain in the right orbital region, which was steadily increasing. Transillumination of the eyeball was negative. X-ray examination showed that the frontal, ethmoidal and maxillary sinuses, as well as the orbit, on the right side were all cloudy. An exploratory operation was performed by a modified Krönlein method. As the incision was completed a milky fluid came out. A **cholesteatoma,** approximately 7x5 cm. in size, was removed from the orbit and the frontal sinus, as the floor of the latter was absent. The condition was believed to be one of secondary cholesteatoma, and it was anticipated that a more extensive operation would be required later. **Raueiser** discusses extra and intraorbital dermoids.

A woman with exophthalmos was examined by **Cousin.** A tumor was found to be the cause. It was removed, and histologic examinations proved it to be a fibroma. **Pfingst** reported a case of tumor of the orbit for which he did an enucleation of the globe and removed the tumor. Four cases of retrobulbar tumors, three fibromas and one sarcoma were reported by **Dahms.** The author discussed methods of diagnosis and treatment. **Carey** reported three cases of tumor in the orbit.

Sarcomas of the Orbit.—The importance of making a differential diagnosis between sarcoma and endothelioma of the orbit is emphasized by **Mayou.** Endothelioma is only locally malignant, and can be entirely eradicated; this is not true of sarcoma.

The author reports two cases of endothelioma of the orbit. Both were in females, one 25 and the other 5½ years of age. The first patient had proptosis of the left eye downwards and inwards. A tumor which arose from the periosteum in the region of the lacrimal gland was removed from the orbit. Radium was used after the operation and six months later the wound had healed and there was no recurrence. After microscopic examination the tumor was classified perithelioma, probably arising from the blood vessels of the periosteum.

The second case was admitted to the hospital because of vomiting. Proptosis and inward displacement of the right eye was noted. The proptosis had increased in a month and ptosis, in addition to a swelling in the right temporal region, had appeared. It was impossible to remove the mass by operation. Seven months after the first examination the child died. A postmortem examination was made and a tumor found which filled the right orbit, extended into the nose, the middle fossa of the skull and outward through the temporal region into the middle ear. It had also perforated the skull in the temporal region. Sections of the tumor were composed of large endothelial cells.

The author summarizes endotheliomata of the periosteum of the orbit as follows: 1. Occur usually before the age of 30. 2. Usually located in outer upper orbital wall. 3. Only locally malignant and spread in continuity. 4. They tend to erode and perforate the bone.

Sarcoma of Orbit.—**Morax** reports a case he saw in 1910, the anatomic specimens of which he demonstrated before the Societe d'Ophthalmologie de Paris. Several days after an injury, the patient noticed protrusion of the right eye, which increased in amount. The condition was then diagnosed as unilateral Basedow's disease, due to injury. Meningitis developed, from which the patient recovered, without change in exophthalmos. He came under the observation of the author March 22, 1910. Examinations showed exophthalmos neither pulsatile nor reducible, ptosis and edema of the lid, keratitis and lagophthalmos. For the latter, a median blepharoplasty was performed. Wassermann negative.

Diagnosis, orbital tumor, not caused by trauma, of which no trace was to be found at this time. Operation, April 23, orbitotomy and removal of tumor. Loss of substance of the upper orbital wall, into which the finger penetrated completely without perceiving cerebral pulsations. The patient died June 1, from inanition and hypostatic pneumonia. Postmortem showed a mushroom-like mass within the cranial cavity, in the left parietal region; also a tumor in the frontal region, to which the loss of substance of the cranium corresponded. Within the orbit was a tumor the size of a nut, lying outside of the orbital contents. Histologic examination showed characteristic structure of sarcoma, arising from bone marrow.

Lecene observed a case of malignant myelocytoma of the orbit. Examination showed a tumor the size of an egg, occupying the left palpebral and superciliary regions. Palpation gave a sensation of elastic softness, not a true fluctuation. The tumor showed pulsations, synchronous with the radial pulse. Diagnosis, pulsatile sarcoma of the orbital margin. The tumor was completely removed and the patient discharged as cured. A few months later the patient was brought back to the hospital for spontaneous fracture of the femur, due to presence in the bone of a malignant tumor. Five months later she died of progressive cachexia. Post-mortem showed no metastases, and the site of the orbital operation showed no return of the original tumor. Histologic examination of the orbital tumor showed it to be a myelocytoma.

Würdemann removed from a man aged 75 years a lymphosarcoma of the orbit, probably within the capsule of Tenon. The growth measured 4 cm. in length and 1½ cm. in thickness. It lay to the nasal side of the orbit. Upon exploration of the depth of the orbit the mass delivered itself in capsule, the only adhesions apparently being to the orbital tissue, to Tenon's capsule and to the tendon of the inferior rectus muscle. There was no recurrence during the succeeding month.

Thomson showed the stereographic radiograph of an orbital tumor in a woman aged 48 years. An extensive operation had been performed for the removal of a growth in the sphenomaxillary fossa, which was supposed to be an osteo-sarcoma, though this was not definitely determined. The present plates showed an extensive bony thickening of the orbit which is filled with a soft mass, most probably sarcomatous. It was evidently inoperable.

In a girl aged 5 years **Kuboki** observed a myxosarcoma of the orbit. The growth was a gelatinous mass which was composed of typical myxomatus tissue and cells. Fifteen cases from the literature are discussed, of which six occur under 10 years, and four from 20 to 30 years of age. It is seldom seen in old people; in one of 50 years, by Hirschberg; one of 55, by Lansberg, and one of 67, by Valerni.

Coffin observed a patient with an exophthalmos. A diagnosis of ethmoidal mucocele was made. The nasal Killian incision was made, but no cyst found. As the naso-orbital wall had absorbed, he removed the remaining portion, well back toward the apex of the orbit. By using a curved periostal elevator a perfectly encysted sarcoma popped out.

Radio-Therapy of Tumors.—After using the X-ray by the Seitz-Wintz method for the treatment of glioma of the retina, **Kummell** noted marked improvement in one eye. However, metastasis had occurred before treatment was instituted. The author concludes that the method should only be used in well selected cases and not as a routine.

De Lapersonne and **Degrais** direct special attention to the necessity for precision in the dose of radium. Radium therapy, like X-ray therapy, has passed through a period of empiricism, and dosage can now be determined almost as accurately as that of ordinary drugs. It is now possible to indicate, (1) the quantity of radium to be employed, (2) the use or non-use of a filter to regulate the depth to which the rays will penetrate, (3) the duration of the application. Three cases are reported as examples. In all, the results of radium treatment were wholly satisfactory. One case, in a little child, was angioma of the eyelid, large enough to cover the eye and surrounding structures. It was treated by seven series of applications at intervals of six to ten weeks. The other two cases, occurring in elderly women, are termed epithelioma; they appear to be what is known as rodent ulcer in this country. All three cases are illustrated by "before-and-after" photographs.

Neill, in discussing epithelioma of the lids and adjacent parts, states that various remedies have been attempted, such as the electric needle, Paquelin cautery, carbonic acid snow, caustic pastes and high frequency current; none of these has proved successful, and, in fact, often stimulate the growth to a more rapid proliferation. The removal by surgery either with the knife or cautery knife has proven the most successful and has been generally adopted. During the past seven years the author's experience has brought him more and more in touch with an advanced viewpoint towards radium therapy, and he has come to the conclusion that basal-celled epitheliomas around the eye are best treated with radium. This opinion is based upon the experience with over a hundred cases. The technique is simple, does not cause pain, causes no scar or keloid, recurrence is rare. Radium will cure 90% of basal-celled epithelioma about the eye if taken early, for the treatment with radium, as with surgery, the earlier the case is seen the better for cure. Thirteen illustrations accompany the contribution.

New and **Benedict** report their experience with the use of radium in the treatment of diseases of the eye and adnexa. The types of cases treated were as follows: Angioma of the lids; blastomycosis of the lids; vernal catarrh; basal-cell epithelioma of lids and canthus; epithelioma of the limbus; sarcoma of the orbit.

Basal-cell epithelioma of the lids without involvement of the tarsus or bone may be entirely removed by radium treatment. The type of epithelioma and its location should be carefully considered before radium is recommended for lesions around the eyes. If the lesion appears to be active and extending rapidly, in all probability it is squamous-cell epithelioma which has developed on basal-cell epithelioma and does not respond to radium so well as the basal-cell type, and therefore should be removed by excision with the knife, or knife and cautery, and the open wound treated with radium. If the bone is involved and there is a reasonable chance of eradicating the trouble, the growth and the eye if necessary should be removed, the bone thoroughly cauterized with soldering irons, and radium used in the open wound. Temporizing in the treatment of epithelioma, especially epithelioma around the inner canthus, is frequently the cause of failure of cure. Radium eradicates the growth in a very large percentage of cases of basal-cell epithelioma involving the lids, but not the tarsus or bone. The patient should return for observation about every six weeks for several months, so that if the trouble is not entirely eradicated by the first treatment, further treatment may be given. However, a large dose of the radium should be given at the first treatment, since frequently the lesion treated with small doses is only aggravated, and the possibility of clearing up the trouble is diminished.

Melanotic tumors should not be treated with radium, but a radical operation to remove the growth should be done, since this is the only means of eradicating the malignancy. A general anesthesia should be employed and the excision made very wide of the growth. If a local anesthesia is used there is always a possibility of traumatizing some of the cells of the tumor. A plastic operation should not be done on the lids for at least six months after the removal of the growth, because it tends to cover up the area in which the recurrence may take place. The case histories reported were: Sarcoma of the orbit, epithelioma of the cornea, epithelioma of the lids, blastomycosis and a perforation epithelioma of the lid, all having been successfully treated by radium.

In a series of eye cases treated with radium and reported by **Janeway** there were seven cases of sarcoma, six of glioma, one of epibulbar melanosarcoma and sixty of epithelioma of the eye lids. Of the seven cases of sarcoma, four were intraorbital. From the author's experience limited to merely choroidal sarcomas, he concludes that radium will produce a temporary improvement, though not a complete retrogression in advanced lesions. Certainly every case operated upon should be given the benefit of one post therapeutic prophylactic treatment. Of the six patients with glioma of the retina, one patient did remarkably well. In the cases with growths of the conjunctiva and lids, service with the use of radium is not too much to term indispensable. A successful result has been obtained in practically all these cases. This does not mean that a cure to date has been obtained in all, nor does it mean in many advanced cases the eye was ultimately saved. It does mean that early epitheliomas of the lids have been cured to date, often by single applications, and that the eye has been saved. In other more advanced cases it was necessary to sacrifice the eye in order to properly treat the lesion.

From their experience in a case of non-operable tumor of the orbit and brow treated successfully with radium. **Bell** and **Toussey** believe that radium is a great therapeutic agent and a valuable adjunct in the treatment of cancerous and precancerous growths. A woman, aged 65 years, injured her forehead, nine months previous to observation, shortly following, a lump began to form which grew to a large size, displacing the eyeball downward and inward. The cornea had ulcerated and perforated. For six months preceding observation by the authors the patient had received antisyphilitic treatment. The patient's teeth being in bad condition, they were extracted, owing to the patient's poor state of health, operation was abandoned and radium treatment instituted. The first treatment, by the application of 20 mgm. of radium salt of 2,000,000 activity, lasted one hour. The radium was inclosed in a sealed glass tube, that again in an aluminum treatment tube, that in a lead wrapping about 1/50 inch thick, and that finally in the soft rubber cover from Oberlauder's urethrometer. Treatments were continued every week for about three and a half months. There was no recurrence one year later. A clinical diagnosis of sarcoma was made. The paper contains reference to the work of others.

Holloway, in discussing the subject, stated that Dr. Bell has referred to the use of radium prior to operations on tumors of the orbit. I think that much would depend on whether the orbit is the primary seat of the growth or whether it has been encroached upon from neighboring structures. To my mind, radium may well supplement operative procedure probably better than operative procedures may supplement radium in certain types of tumor formation. Clark reported his experience in the early use of radium without protection for the destruction of a tumor of the orbit. The patient also had an optic nerve atrophy, later a zonular cataract developed possibly as the result of the use of radium. Vail observed a case in which he made a tentative diagnosis of cylindroma entirely clear up under the use of radium. Lamb relies on the X-ray to control and supplement operative procedure.

Kusama writes in detail his experience with the use of X-ray and radium in the treatment of retinal glioma. These cases are reported with autopsy findings and microscopic examination. The three cases treated with X-rays and radium all were suffering from retinal glioma in its second stage. In consequence of the application to them of X-rays and radium, the tumors themselves shrank, but at the same time the eyeballs underwent a similar change. One patient developed signs of meningitis, the second had metastatic tumors in the frontal and temporal regions, and the third (the autopsied one) had similar metastatic tumors in his cranium, as well as the internal organs, and all three cases terminated in death. The shrinking of the tumors in the eyes took place in a striking manner after a few exposures to the X-rays, but the phthisis bulbi took at the shortest seven months, and at the longest two years. From the time in which the phthisis bulbi was first noticed until death occurred the course was rather rapid, from three to five months only. From the discovery of the metastatic tumors to the time of death the interval was very short; in the second case, two months, and in the third case only one month. The interval between the commencement of treatment and death was the shortest, eleven months, and the longest two years. According to his experience, our mode of application of the X-rays could not prevent the growth of metastatic tumors. The X-rays vigorously used would destroy the tissue of all morbid tumors, but, if weak, might on the contrary, stimulate the growth of such tumors. If, with retinal glioma in both eyes, one eye only be thus vigorously treated, the other eye remaining untouched, may not the malignancy of the untreated tumor become enhanced by more rapid extension along the optic nerve, through the sclera, or by general metastasis? The question of the effect of X-rays upon the growing eye is discussed very fully. One interested in the subject will do well to read the original. The paper contains illustrations and a good bibliography. **Uhthoff** and **Kummell** each contribute to the literature on radiotherapy in the treatment of glioma. **Burrows** writes on the work of the Manchester Radium Institute. The contribution contains sixteen illustrations.

Liégard and **Offret** cured a large epibulbar tumor by penetrating x-rays. The tumor covered almost the whole globe, but there were indications of metastasis. A portion removed for microscopic study showed that it was of the papillomatous type of a benign nature. By the third treatment the tumor had commenced to shrink, and after the fourth it had disappeared except in the superior culdesac; V. 11.0 (aphakia from cataract operatim) = 6/10.

A cure of a lymphoma of the orbit with exophthalmos by very penetrating X-rays is reported by **Chevallereau** and **Offret.** The case was of sixty-seven years standing. The first symptom was exophthalmus with diplopia. Removal of subconjunctival lipoma in 1919, followed by increase of exophthalmus. It was then treated by X-rays, a full description of the treatment being afforded. After five treatments there still remained a slight convergent strabismus and a little diplopia.

Grier treated successfully by roentgen ray two patients with xeroderma pigmentosa. The patients were brother and sister, with a family history of similar condition in the father's sister, the father's father and the father's grandfather. The girl, aged 16, lost her right eye following an unsuccessful removal of an epibulbar carcinoma. One year later a similar growth appeared at the cornea-scleral junction. One-third of an erythema dose was applied at each sitting. Fifteen treatments were given at intervals during the ensuing months. The growth entirely disappeared, leaving only a small transparent scar. There has been no recurrence in two years. The numerous pigmented spots were treated with massive doses. The brother, aged 16 years, had a similar small growth on the eyeball to the nasal side and also numerous skin lesions. This patient received the same treatment with satisfactory results.

Epithelioma of the orbit treated with radium is reported by **Poulard.** There was no recurrence over a period of ten years. In discussion Liégard reported tumor of the orbit in which the use of radium resulted in failure and was followed by atrophy of the optic nerve.

Injuries

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This section carries the literature from August, 1919, to October, 1920. For previous references, see A. J. O., v. 2, December, 1919, p. 271.

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DIGEST OF THE LITERATURE.

Injuries by Light and Ultraviolet Rays.—Two cases of burns of the retina were studied by **Klauber**. One case occurred in a metal welder. He had no protecting glass for the right eye, and after working about two minutes he saw colors and then a black cloud in the center of his right visual field. There was no reaction in the lids or anterior segment of the eye. The media were clear. In the macular region a vertical light-colored area, one disk diameter in length and slightly narrower horizontally was noticed. Two small hemorrhages were noted, one on either side, broadening the swollen area near its middle. A large central scotoma was present. Seven weeks after the injury the vision was 6/10, and the fields had returned to normal. Subconjunctival injections of sodium chlorid was the medicinal treatment.

In the second case the burn followed an exposure for a few seconds at a short distance from an electric arc. Greenish yellow spots were noted in the macula, and the temporal side of the disc was pale. The vision remained 6/24 and could not be improved. A scotoma for blue and green at the fixation point was the only abnormal defect in the visual fields. The author contrasts the two cases. In the first only the superficial elements were involved and no permanent damage was done; while in the second case the deeper elements suffered and the changes were permanent.

The views of **Van der Hoeve** regarding the injury to the macular ciliary processes, and lens by ultra-violet rays are given on p. 142.

Chotzen and **Kuznitzky** have studied the experimental and clinical effects of the ultra violet rays upon the cornea. The rays obtained from a Krommayer mercury lamp were applied to the normal eye at the region of the limbus, the iris serving as a filter. The duration of the application was from 5 to 15 minutes. Effects produced: After six hours conjunctival injection and localized chemosis; disturbances of the epithelium; twenty-four hours later, very pronounced disturbances; conjunctivitis and complete chemosis; one and one-half to two days later rugosities of the cornea with differences of level; four days subsequently repair with vascularization. After ten to twenty days, entire clearing up of the cornea to complete transparency.

The duration of the application is without effect upon the evolution of the symptoms. The sole permanent trace of the application is a localized depigmentation of the iris, and this only in cases where the application had exceeded five minutes; no iritis, no disturbances of the media and fundus. Microscopic examination showed infiltration of the conjunctiva with desquammation of the epithelium; absence of Bowman's membrane, swelling of the layers of the cornea, degeneration of the nuclei, disappearance of the endothelium of Descemet's membrane with deep leucocyte infiltration. They conclude that the effect of these rays is quite superficial and never leads to necrosis. In therapeutic application, these writers consider the rays contraindicated in acute catarrh, but applicable in chronic and torpid forms.

Injuries From X-Rays.—In **Ehnhuus's** case an eye affected with carcinoma of the inner canthus received nine X-ray exposures with a hard tube in the course of a year, the eyeball being covered with lead. Vision and fundus normal. Following the last exposure the vision became reduced to 20/70, with lacrimation and photophobia. There was marked injection of the bulbar conjunctiva. Cornea, iris and lens normal; optic disc blurred; yellowish-white plaques in the retina about one-quarter size of the disc. A few months later the external injection had disappeared, the plaques on the retina were whiter and atrophic. Vision had returned to normal.

Injuries by Irritating Gases.—Attention is called by **Derby** to two varieties of deleterious gases. The first, the so-called lacrimatory gas, caused burning pain, copious lacrimation, injection of the conjunctiva and photophobia. There was also fine exfoliation of the epithelium of the cornea. These cases usually recovered in two weeks or less. Much more serious were the injuries inflicted by "mustard gas." This caused sneezing, painful irritation of the nose, throat and eyes and sometimes vomiting. Its effect was not noticed until from two to six hours after exposure, when severe erythema of the skin developed, followed by blistering; respiratory symptoms also occurred, and in severe cases bronchitis and secondary pneumonia. There was profuse lacrimation and injection of the conjunctiva. The mild cases constituted 75 to 80 per cent of those affected. In the more severe, the lids showed redness and swelling and frequently bullae; they were tightly pressed together and all attempts to open them caused severe pain.

The corneal lesions were of varying severity, consisting principally of roughening of the epithelium with irregular areas of opacity; eyes that are bandaged are made worse. The lesions are in the nature of a chemical burn. The nervous effect produced by the severe irritation of the eyes sometimes caused a neurotic condition hard to overcome. The gas mask will protect the eyes from the effects of mustard gas, but if they have been exposed to it, they should be washed out frequently with sodium carbonate or boric acid solution. A drop of some oil, such as liquid alboline, should be instilled, and atropin used if there is much blepharospasm or irritation. A shade or dark glasses should be worn but no bandage. In secondary infection, protargol or argyrol should be employed. Cold bathing and sulphate of zinc are also of value. The patients always recover full vision unless severe involvement of the cornea has taken place.

Danis describes the effects of asphyxiating gases upon the ocular apparatus. There are two kinds—the tear-producing and the blistering gases. The former cause itching, burning, lacrimation, blepharospasm and photophobia; the bulbar and palpebral conjunctiva are strongly hyperemic, but there is no ciliary injection and corneal lesions have never been observed. The blistering gas causes no immediate symptoms, but the latter first appear five or six hours after exposure and attain their height eighteen to thirty-six hours later. The lesions consist of conjunctival and ciliary injection, which always precedes the subjective symptoms. The corneal epithelium often shows a slight lesion. In other cases, the cornea presents a general clouding. Deep and extensive ulcers have been reported, but Danis has never seen them. Although not serious, these lesions are difficult of management and slow in healing, requiring two months on an average.

In **McKellar's** case a soldier had been exposed to mustard gas, September 24, 1918. This was immediately followed by an attack of inflammation lasting six weeks. A second attack occurred March 20, 1919. Only one eye was affected, with recovery in a week. A third attack occurred a month later and lasted about one week. Two months thereafter the eyes experienced a fourth attack which was observed and reported by McKellar. There was profuse lacrimation but no purulent discharge, conjunctiva hyperemic with a superficial ulcer of the cornea in one eye. Two weeks after recovery there was a relapse in one eye, much milder than the previous attack. There had been no further trouble when last seen four months later.

Reed concludes, after experiments with dichlorethylsulphate (mustard gas), that the eyes of man are more sensitive to the chemical than the skin. A concentration of one part of the gas in ten million parts of air will produce a visible reaction in less than an hour's exposure.

Injuries by Emetin.—Reports of five instances of emetin in the eye are published by **Moreau**. Acute pain is a prominent symptom. This pain is rapidly controlled by lavage of warm artificial serum. The conjunctiva was injected in all the cases and two presented an alteration of the epithelium of the cornea. A corneal ulcer formed in one.

Injuries by Indelible Pencil.—In **Elmer's** case the lower lid was slightly swollen and the palpebral and bulbar conjunctiva of the lower fornix was congested, chemotic and stained an intense purple, the color of the common indelible pencil. Among the tarsal folds was a clean-cut, nearly black ulcer, almost penetrating to the infra-orbital margin. Under treatment healing was complete. A small scar remained at the site of the ulcer. It was not ascertained how this caustic substance could have entered the eye. A cosmetic for eyebrows and lid margins might have been the source, but such accidents have been known to occur from pencil lead, though the effects have not been as violent as in this case. Cases of ocular injuries by wound or fragment of indelible, colored pencil are reported by **Hack** and **Oloff**.

Injury by Chlorinated Lime.—An article in the **Journal of the A. M. A.**, v. 73, p. 1769, calls attention to burns of the eye by chlorinated lime, due to a sudden explosion of gas while opening the can. In most cases complete recovery followed. The care of such cases usually includes anesthetization with holocain and cocain and the removal of the remaining particles of lime. The irrigating fluid should be a weak solution of vinegar. The most serious and important sequel is symblepharon. (The reviewer observed several cases of extensive opacity of the cornea). To avoid these accidents a small hole should be punched in the container to allow the gas to escape before the top is taken off the can.

Denig, in opposition to the general view, which is for waiting to interfere in burns of the conjunctiva until granulation is well under way, advocated as far back as 1912 immediate surgical interference for severe burns, consisting in removing the burned conjunctiva, if necessary, all around the cornea and replacing it by mucous membrane from the mouth. He divides such injuries into three groups, according to the intensity of the burn. The mild cases will take care of themselves under the usual treatment. The severer ones may do the same, but they will require immediate grafting, if, shortly after the accident, secondary infiltrations of the cornea begin to set in. Only immediate surgical interference—grafting—will clear up the secondary infiltration of the cornea. The third group includes cases in which the cornea is destroyed nearly or entirely. A case is reported in which the tissue burned by chlorinated lime was immediately removed, and mucous membrane from the lip taken to replace it. Speedy healing and an excellent result followed.

Injury From Golf Ball.—One of these cases of chemical injury to the eye by rupture of a golf ball and expulsion of its contents is reported by **Meyer** from South Africa. **Hill** has written on injuries of the cornea.

Burn by Salt of Copper.—Following an explosion of a mixture containing a salt of copper and ammonia, **Hansell** observed injury of both eyes. The palpebral conjunctiva and cornea were hidden from view (except the pupillary area of both corneas) by a dark blue, thin, smooth layer of the explosive, which could be easily removed in little pieces. The epithelium of the cornea and conjunctiva came away with it, leaving a raw, bleeding surface. The unwounded portion of the cornea had preserved its epithelium, but had lost its transparency because of a superficial infiltration. This increased and both corneas became entirely denuded of their epithelium. The dark, smooth layer of foreign substance was a salt of copper, probably the oxide, which had more or less rapidly destroyed the superficial tissues. The exploding material was not hot, and therefore the injury was not strictly a burn, but a destruction by chemical action. Recovery has been incomplete, convalescence prolonged and the anatomic changes, at first superficial, later involved the deeper tissues.

Ruptures of Cornea and Sclera.—Rupture of the sclera of both eyes from a shell wound was observed by **Beauvieux**. The length of the rupture in the right eye was about 2 cm; the external extremity of the wound was 2 mm. from the sclero-corneal limbus and 1½ mm. at its internal margin. It extended from the upper edge of the tendinous insertion of the external rectus to the center of the insertion of the internus. The lens was luxated into the anterior chamber; there was total detachment of the retina. The left eye presented a circular and subconjunctival rupture of the sclera involving two-thirds of the anterior segment. The lens was luxated inwards and backwards. Both eyes were, of course, blind. The reporter believes that such ruptures are due to atmospheric concussion caused by the enormous and sudden variation of atmospheric pressure from deflagration of a large-caliber projectile. A cone of air under these circumstances acts like an exploding solid body. Animated by a great initial velocity, it strikes the ocular globes, which like two rubber balls are driven in upon one of their axes and ruptured in the line of the equator of the depression at the thinnest point of the fibrous envelope, which is just in front of the insertion of the recti muscles.

Fuchs points out that in indirect ruptures of the sclera the break can be seen, while in indirect scleral ruptures the break may not be visible, but the tension is diminished.

Kagan mentions the occurrence of subconjunctival pigmentation following indirect rupture of the sclera by contusion.

Deep Injuries by Contusion.—In a previous article (Y. B., v. 13, p. 364) **Frenkel** called attention to a traumatic syndrome affecting the anterior segment of the eye. As a continuation of his studies of the subject the essayist reviews the various theories which have been advanced to explain the mechanism of traumatic phenomena in the anterior segment of the globe and contrasts them with his ideas. His last paper considers iridodialysis due to contusion of the eye. Frenkel claims that iridodialysis and other injuries to the iris and lens capsule following contusion is, in most instances, due to sudden pressure produced from behind by the lens which has been torn loose from some of its zonular fibres (subluxated) by the hydrostatic force exerted from the vitreous. When a force is exerted on the anterior segment of the globe flattening occurs and the aqueous and vitreous are displaced laterally at the instant of impact. The vitreous being more elastic resumes its normal position sooner than the aqueous and exerts pressure from behind upon the lens which is subluxated and pushed forward with considerable force against the iris and produces the injuries in question. In contusions applied to the side of the eyeball the direct force is the factor added to the hydrostatic phenomenon.

Didier, analyzing the cases of 72,312 wounded soldiers during the war, has found thirty-seven instances of iridodialysis with integrity of the globe, the separation was total in five cases, partial in the rest. The writer studies the mechanism by which the lesion is brought about and the action of the different traumatic agents, such as windage of the projectile, distant shock and shock upon the globe itself. He gives the prognosis and estimates the resulting incapacity and pension to be awarded.

Bane reports immediate blindness with very severe pain from a blow in the eye with a leather tip which had flown off a whip. Five days later the iris was found to be detached at the upper outer margin over an area of about 5 mm.; there was blood in the anterior chamber; vision equaled hand moving at 1 foot; tension reduced to 6 mm. of mercury. Under treatment the eye improved and vision rose to 4/60.

In **Thompson's** case the eye had been hit with a bean shot from a bean-shooter. The sphincter of the iris was torn through at intervals of about 2 mm., all the breaks in the muscle being of the same depth. The pupil, 5 mm. in all diameters, reacted sluggishly to light and accommodation. There was also apparently a disturbance of the ciliary muscle, as the patient could not read without a plus 2 D. sphere, although distant vision was normal with cylindric correction. There were two opacities in the lens, but the eye was apparently otherwise normal.

Three cases in which the eyes had

been injured by air concussion were seen by **Stanke.** In one case the posterior ciliary vessels had been torn, the second had a ruptured choroid, and in the third a retinitis proliferation, which was secondary to injury of the choroid and retina, was present.

Kraupa gave a report on the various types of lesions which followed contusion of the eye. **Soria** saw a partial dislocation of the left crystalline lens which followed an orbital injury, and **Jones** saw a man who had a traumatic dislocation of the lens. **Lauber** has written on evulsion of the iris. **Strebel** has reported band-like keratitis and peripapillary atrophy following contusions.

Fundus Lesions by Contusion.—Three instances of traumatic lesions of the fundus with conservation of the eyeball were reported by **Gazepis.** A characteristic phenomena was the preservation of the inferior half of the visual field with a notch at the point of fixation. This hemianopic field with the notch at the fixation point is quite characteristic; it is seen occasionally also in detachment of the retina alone. It is essential for its occurrence that there be both macular and peripheral lesions. The choroidal lesions in this case did not account entirely for the loss of field, but contusion of the retina must have occurred also. Another necessary condition is the intrafacial course of the projectile or severe contusion of the inferior orbital margin.

In **Fleck's** case a soldier had been injured by a high explosive shell. There was a laceration of the left lid, contusion of eyeball with a rupture of the retina at the macula, exposing the choroid. The case was interesting, as most cases of this type cause other extensive lacerations of the choroid, while this destruction was limited to one spot.

Bab discusses ruptures of the choroid in war. The causative injury is generally indirect, the projectile not actually touching the globe. He considers especially contusion effect through atmospheric pressure. He believes that it has not yet been proven that rupture of the choroid can occur from atmospheric pressure or windage. In cases where such have been assumed as the cause, other certain or probable causes have been discovered later. The skiagram may show the explanation.

McDavitt reported a case in which there were numerous small ruptures of the choroid caused by the concussion of an exploding shell.

Charles observed a case of injury to an eye by a tennis ball in 1907 in which there was at first a hyphema with large pupil. When the media had cleared the appearances exactly simulated rupture of the choroid; vision, 19/30. In 1908 the vision was still the same. At the end of two years the vision was found to be 19/15, and the exudate near the macula had vanished except for traces of pigment. The pupil is still slightly larger than that of the other eye, but accommodation is sufficient for reading.

Gonzalez gives an illustrated description of the retinal appearance in an eye which had apparently been perforated at the forea from a contusion in childhood; visual acuity diminished. There was a pear-shaped foramen, two-thirds of the papilla in size; retinal vessels apparently normal. He finds seventy-nine cases in the literature, with a history of trauma in 81.8 per cent.

Menacho reviews the theories which explain the causes of indirect rupture of the choroid following trauma. The author describes four cases which came under his observation and publishes illustrations of each. In three of the cases the concavity of the rupture of the choroid was toward the disc, and in one the convexity faced the disc. In the latter case the author believes that the retraction of the superior and inferior oblique muscles at the time of the trauma accounted for the inverted position of the ruptures. **Verwey** has recorded the loss of an eye through indirect injury.

Buchanan reports extensive rupture of the corneo-scleral margin from a cow's horn. After enucleation the eye was found collapsed, all the normal contents having been either extruded or so much displaced and damaged that the eye was manifestly useless. The cornea was found to be hanging by a comparatively narrow portion and free of the lower margin and free all around elsewhere. The extent of the rupture was greater than three-quarters of the corneal circumference. The rupture was smoothly and cleanly defined as if made by a punch and situated about 1 mm. from the apparent corneo-scleral margin. The injury was probably brought about by a combination of direct and indirect violence.

Penetrating Injuries of the Eye.—A prolapsed iris which was secondary to a corneo-scleral wound was replaced into the anterior chamber by **Bettison.** After thoroughly cleansing the eye the sclero-corneal wound was held opened with a spatula and a 1 per cent solution of pilocarpin allowed to run into the anterior chamber. The pupil contracted and the iris was drawn into the anterior chamber. The wound was then closed and the eye bandaged. The following day atropin was used because of ciliary congestion. The final result was good and the man had normal vision. The author had success in three other similar cases treated in this manner.

In **Strickler's** case there was a cut in the cornea extending from the outer pupillary margin almost vertically downwards to within 1 mm. of the limbus below, slight prolapse of the iris and a horizontal cut in the iris extending outward 4 mm. The lens capsule was punctured to the temporal side, which was cataractous with striae in the nucleus. Swollen lens matter welled into the anterior chamber through the tear in the iris.

In **Whitaker's** case a penetrating wound involved the corneo-scleral margin and extended over 3 mm. into the cornea; the iris was torn, but the lens and ciliary body were uninjured. Iridectomy of the protruding iris was performed, and the opening covered with a conjunctival patch. This patch was not strong enough to hold, but "ballooned" with further protrusion of iris. A second iridectomy was done and a double conjunctival patch employed with the same unfortunate result. The eye showed no plus tension with a McLean tonometer. The reporter thereupon transplanted a graft of fascia lata as follows: The conjunctiva over the wound was cut away and undermined well back. At the corneal edge of the wound the cornea was split; the opening into the eye was then entirely exposed, irregular in shape and about 4 x 3 mm. in size. The operator removed a piece of fascia lata about 1 cm. square, trimmed off the edge to dovetail into the split cornea. This patch was placed beneath the conjunctiva with its beveled edge in position, where it was anchored with a single stitch, passing through the fascia lata and outer portion of the cornea. A silk suture was then passed through the other edges of the fascia, emerging through the conjunctiva well back. By tightening these three stitches they could be used as "guy ropes" against the point anchored to the cornea to make the patch fit more snugly to the eye, and at the same time loosen up the conjunctiva with which to cover it. These stitches were then tied and the patch entirely covered with the conjunctiva. Six months later the vision was 20/20 with correction.

An extraordinary accident came under **Clarke's** observation. The patient had been intoxicated and stumbled while carrying a three-pronged fork in his hand. One of the prongs, 3.5 mm. long, had pinned down the external rectus and immobilized the eyeball. Another prong, 3 mm. long, was lying horizontally in a fold of conjunctiva under the lower lid, and the other prong, 2 mm. long, was found under the upper lid. The eye was uninjured. The globe regained all of its mobility after the removal of the larger prong.

Wiley reported a good result in an extensive sclero-corneal wound due to flying glass. **Gibson** reported a penetrating wound of the cornea produced by a splinter of wood. **Stillson** reported a case of perforating injury of the right cornea. **Story** showed a case of corneal wound with anterior synechia. Deep penetrating wound of the eyeball is reported by **Marangoni.**

Seven cases of injury to the eye from the explosion of spring caps stimulated **Zimmerman** into calling attention to the dangers of this explosive. The German hand grenade is made of two portions which are carried separately. The spring cap is a small metallic cylinder which contains an explosive and when inserted into the grenade proper acts as a concussion cap. The caps if struck or heated, explode. In six of the author's cases there were perforating wounds of the eye.

Jones observes that while the deep tissues of the eyeball are highly susceptible to infection after penetrating wounds, these parts are for obvious reasons incapable of being treated by efficient germicides. He proposes to alter this situation by exciting an abundant flow of lymph, which is nature's antiseptic and tissue restorer and goes to every part of the eye that a germ can reach, by massive subconjunctival injections of mercuric cyanide in conjunction with certain other drugs. These injections cause speedy distension with lymph of the conjunctival spaces and loose tissues of the lids. In an experience covering fifteen years he has had excellent results in all manner of extensive and deep penetrating wounds, many with non-recoverable foreign bodies with no signs of infection or damage aside from the original injury. He advocates its wider use not only in deeply penetrating wounds, but also in the wounds attendant on magnet operations.

Goulden writes upon the necessity in prolapse of the iris, not only of removing the piece of iris prolapsed, but also of clearing the wound of uvea. If left with iris incarcerated, one of the following undesirable conditions will supervene: (a) delayed healing of the wound; (b) a weak scar which may bulge before the intra-ocular pressure; (c) defective vision from displacement of the pupil and irregular refraction of the cornea; (d) iridocyclitis; (e) sympathetic iridocyclitis. Attempts at reposition should be avoided on account of the risk of infection of the interior of the eye and the certainty of a reprolapse of the reposed iris. He divides the cases into three groups—wound purely corneal at the limbus or beyond the limbus into the sclera. Lucid directions with illustrations are given for the management of each of these conditions respectively.

Shields observed a man whose right eye had been injured about thirty-three years previously while he was pounding a hot metal plate, and whose left eye had been penetrated by a sliver of steel three years previously. A fellow workman had pulled the sliver of steel out of this eye. A metallic foreign body had probably penetrated the right eye. This eye had faulty projection. Following the injury to the left eye there had probably been a corneal infection and a general uveitis, since the eye was still somewhat injected and blood vessels were present in an adherent leucoma. The question was raised whether an iridectomy would be likely to succeed.

Lapersonne advises primary suture in all recent orbito-ocular wounds. Local or regional anesthesia is called for (adrenalized 4 per cent novocain solution). Directions are given for producing such anesthesia of the globe itself and of the sensory nerves of the orbit. Such regional anesthesia is supplemented by lesser injections under the conjunctiva. Subcutaneous infiltration in forehead, cheek and temporomalar regions make veritable barrages.

In **Wallace's** case the sclera had been penetrated 4 or 5 mm. to the temporal side of the iris by a 6-penny nail; there was some loss of vitreous; vision 20/80; there were large floaters in the anterior vitreous immediately behind the lens. The question of enucleation was raised.

Percival has seen three cases of accidental injuries to the trochlea resulting in inaction of the superior oblique with the usual symptoms in paralysis of that muscle.

He thinks that such an occurrence which has been noted from time to time as an unfortunate complication in operations may not be so very uncommon as the result of an injury. **Rocha** has reported a case of ocular injury from a nail. **Haab** devotes an inaugural dissertation to penetrating wounds of the eye. **Le Pendu** has written on enucleation or evisceration in the treatment of ocular wounds, and **Meller** upon the retention of injured eyes. **Sidler Huguenin** has written on ocular injuries.

Tetanus From Penetrating Wounds.—A case of tetanus consecutive to a lesion of the eye has been reported by **Castelain** and **Lafargue.** The patient was wounded in the left eye by a small metallic splinter. Thirty-six hours subsequent to the traumatism rapidly progressive panophthalmitis developed and exenteration was performed. On the seventh day symptoms suggestive of commencing tetanus appeared which became confirmed upon the following day. Complete paralysis of the left facial nerve, contraction of the muscles of the right side of the face, difficulty in opening the mouth (trismus), ophthalmoplegia of the right side; the right pupil was contracted without reaction to light. It thus appears that the first symptom was facial paralysis, trismus the second, while the ophthalmoplegia was the last; but all the symptoms appeared very rapidly, all being noted at the expiration of twelve hours, and all remained limited to the head. Treatment consisted in the intravenous administration of large doses of tetanus antitoxin with antispasmodics. The absence of general symptoms and the final cure may be justly ascribed to the prompt recognition of the affection with immediate treatment. The reporters tabulate twenty-two cases from the literature of tetanus consecutive to ocular injuries.

Foreign Bodies in the Cornea and Conjunctiva.—**Leplat** observed a wound of the cornea from a chestnut burr. Eight spines had penetrated into the cornea, two penetrating completely. Extraction was easily accomplished with the aid of a cataract knife. Rapid healing followed without complications.

A man, aged 21, was seen by **Chambers**, who found a corneal leucoma with what appeared to be a broken-down corneal ulcer in its center. Upon close inspection a piece of metal, 1½ x ½ mm., was found in the base of the ulcer. The metal had entered the cornea five years before and was the cause of the leucoma.

Reitsch contends that the prevalent practice of removing foreign bodies from the cornea with a spatula or cotton results in farther injury. He cocainizes the eye and forcibly syringes the foreign materials from their bed with a warm 3 per cent solution of boric acid. **Richter** calls attention to the value of a loop of horse hair or pig's bristle for removing foreign bodies from the cornea. **Jennings** discussed the removal of foreign bodies from the cornea.

A piece of prairie grass measuring 1.5x1.5x1 mm., surrounded by granulation tissue, was discovered by **Allen** to have been the cause of irritation of the left eye of a man for a period of over three months. The foreign body was located in the superior retrotarsal fold.

Garcia Mansilla saw a case in which a beard from barley penetrated the upper eyelid near the inner canthus and lodged under the conjunctiva in the region of the caruncle where it excited a severe inflammation with the production of granulation tissue. After the removal of the foreign body the inflammatory condition subsided.

A man with a contusion of the eye due to oil, which had been under fifty or sixty pounds pressure, was shown by **Langdon.** Small oil droplets penetrated the conjunctiva and produced two irregular horizontal pigmented patches, one above and one below the cornea. Under dionin and hot applications the staining disappeared.

Lashes in Anterior Chamber.—In **Bulson's** case there was a triangular wound of the cornea 5 or 6 mm. in length. There was no prolapse of iris, but the anterior chamber was so full of clotted blood as to prevent determination of the extent of the injury. The X-rays disclosed no foreign body. The blood in the anterior chamber was absorbed slowly, but the eye continued irritable and painful. Some weeks after the injury five eye lashes were seen lying across the pupil and resting upon the anterior capsule of the lens and partly upon the lower pupillary margin of the iris. Four months after the injury, the eye having continued to be irritable with more or less lacrimation and photophobia, five full-length cilia were removed from the anterior chamber one by one with Liebrecht's iris forceps through a small incision at the limbus.

Marquez presented a case with an eye lash in the anterior chamber of the eye. The lash had been carried into the globe by an object which perforated the lower portion of the left eye at the limbus. When first seen there was a marked inflammatory reaction, which subsided and the eye tolerated the presence of the eye lash in the anterior chamber.

Removal of Foreign Bodies From

Anterior Chamber.—Goulden writes on the removal of non-magnetic foreign bodies from the anterior chamber. The reason why it is so difficult or impossible to remove the foreign body in the manner usually attempted by an incision at the limbus with a keratome at the site of the foreign body is largely due to the fact that the incision at the limbus is not in the same plane as the iris and therefore of the foreign body; consequently it is not possible in so small a wound sufficiently to depress the points of the forceps so as to hold the foreign body securely. He advises, therefore, to make a keratome incision in the cornea half way between the limbus and the center in the quadrant of the cornea over the foreign body. The latter may now be easily seized with toothless iris forceps and withdrawn. The risk of prolapse of the iris is also avoided by such an incision.

Foreign Bodies in the Lens.—In **Pichler's** case the lens presented even to the naked eye, but more distinctly with the pupil dilated and the corneal microscope, at one point a discoloration or better, perhaps, a red or green spot with a tinge of yellow. To the expert physicist the yellow corresponded to the sodium line of the spectrum. The play of colors was most marked if the observer accommodate upon the immediate subcapsular layer. Of a transparent disc of the anterior surface of the lens described by previous observers nothing was visible while a zonular opacity was present in the deeper layers, partially concealing the posterior reflex. The cause of the phenomenon was a sliver of copper from a conducting wire received during the war; the presence of which the patient knew nothing. It was found after extraction from the vitreous measuring 2 mm. in length and weighing less than 0.05 milligrams, and must have penetrated the globe by its own force. In two other injuries, but not from copper, the reporter also observed a play of colors. The same grouping of colors sometimes mixed with reddish-green and sometimes also with yellow could be observed in soap bubbles; they are phenomena of interference with which the copper has nothing to do.

In **Stein's** case the eye was struck by a small fragment of metal. Not much reaction followed, but the vision failed. Examination disclosed a small scar of the cornea, beginning opacity of the lens and a minute, faintly glistening foreign body on the posterior capsule. The Sweet and giant magnets made no impression on the foreign body. X-ray showed the object to be 3 mm. behind the center of the cornea. It is undoubtedly metallic but may be non-magnetic.

Papers on lenticular changes, which occur in eyes which contain foreign bodies of copper, are published by **Esser, Klauber, Kümmell, Purtscher** and **Rumbaur.**

A woman, 42 years of age, who had had poor vision in the left eye since childhood, was examined by **Blaxland.** There was a scar in the cornea and a foreign body was located in crystalline lens of the defective eye. The author believed that the foreign body had entered the eye when the patient was a child.

Foreign Bodies in Vitreous and Posterior Coats.—The paper of **Lagrange** shows that the gravity of injury of the eye by a foreign body depends on whether the ciliary region is involved or not. Every medical man should be able to enucleate the eye, if required. Even when the foreign body is not in the ciliary body, if the eye is somewhat tender, and there is lowered tension, and the nutrition is suffering, it should be enucleated. The eye should also be removed when there is old active cyclitis which has resisted treatment for several months without marked improvement.

Vinsonneau thinks that any physician can remove a foreign body from the eye if it is not embedded too deeply and is recent; but he should refuse to attempt removal of a deeply embedded foreign body or one that has been in the eye several days.

A man who had been injured by an explosive six years previously consulted **Meissner** because of redness and pain of the eye. The eye had been quiet until a few days before. A dark speck was noted in an atrophic globe. It was removed with forceps and found to be a large iron body which weighed 3.8 grams. The fellow eye was normal.

Two cases in which minute iron

splinters entered the globe are cited by **Koerber**. In one case a foreign body measuring ½ by ¾ mm., was embedded in the sclera. The sideroscope reaction was positive. In the second case the iron splinter rested on the iris. By introducing the point of a spatula into the anterior chamber and applying the tip of a hand magnet to the instrument handle the foreign body was easily removed. The splinter measured 0.47 x 0.34 mm.

Harlan reports a case of shot in the eye as shown by X-ray. When seen, after the lapse of some time, the vision equalled 20/30 with correction. **Tobias** has reported a case of splinter of nickel in the retina.

McReynolds presents the subject of foreign bodies within the eyeball under the three heads of location and character of the foreign body, proposed manner of relief, probable, immediate and remote results. As regards the location and character, the history may be of the greatest value, especially if the foreign body is of such a nature as not to show by the X-rays, or if non-magnetic and thus without response to the magnet or sideroscope. When in doubt as to whether the foreign body be just within or without the sclera, if the traumatism has not been excessive, it is justifiable to wait during the ten-day period without risk of sympathetic ophthalmia when many illuminating features may develop to guide the treatment. As to removal by the magnet, the question of route, whether anterior or posterior, is still sub judice. The writer prefers to invade the posterior segment of the globe rather than the ciliary zone, unless the conditions are such that the foreign body can be smoothly extracted by the anterior route. As regards the final result, weeks and months must sometimes elapse, even after successful extraction, before the final account is settled both as regards the injured eye and the danger of sympathetic involvement of its fellow. The histories of a number of illustrative cases are given in detail.

Allport discusses practical points in the diagnosis and removal of foreign bodies, using McReynold's paper as the occasion. He has never found objects too small to be noticed by the X-ray. To determine whether a foreign body is inside or outside the scleral structure, the writer uses what may be termed a moving picture. The patient moves the eye two or three times during the exposure, to ascertain whether the object moves with the eye or not and the extent of the excursion. While he admits that the lens is quite tolerant of small objects for a while, trouble is bound to ensue and they should be removed as soon as possible. As regards non-magnetic bodies, he has never seen glass in the eye or conjunctival sac, although he has had many cases where the eye had been cut and the glass was said to have been removed. The writer removes all fragments posterior to the lens through a scleral opening for which the Sweet magnet has proven sufficient. As regards localization, the writer is convinced that less elaborate methods are sufficient for all practical purposes, though there are occasional cases where more exact localization is highly desirable.

Discussing diagnosis and prognosis of foreign bodies in the posterior segment of the eye, **Baudry** reports two cases in which the presence of the foreign body was overlooked and favorable prognosis given. But later the eyes were lost. The vision had remained normal after the injury. In one case in a soldier who was regarded as having a conjunctivitis at the limbus, and in a child wounded by a shot in the inferior culdesac, but which was supposed not to have penetrated the globe. In both chronic inflammation and detachment of the retina had followed. The tolerance for such foreign bodies depends on many factors, but especially on the absence of sepsis.

Shoemaker writes upon penetrating and perforating wounds of the eyeball, with diagnosis and treatment of retained foreign bodies. **Smith** reported on complications following foreign bodies in the eye.

Localization of Foreign Bodies.—Gallemaerts and **Henrard** describe Wessely's method of localizing intraocular foreign bodies. Wesseley had made coquilles in which the cornea is represented by glass rich in lead; the position of the cornea is shown upon the radiographic negative by a well-marked opacity; the remaining portion of the coquille is also marked by a fainter shadow, especially when the plate is taken in profile. In place of the complete disc the cornea may be indicated simply by a ring more or less wide; coquilles of this form are particularly adapted for occipito-frontal radiography. In the practical application of the method a series of protheses of varying dimensions and curvature should be at hand. In some, the cornea should be complete; in others, represented by a circle. It is well also to have two transparent coquilles upon which bits of tin may be placed. The coquille best adapted to the eye under examination is introduced between the lids after instillation of cocain-adrenalin. The tears filter in between the eye and the glass, causing sufficient adhesion for the coquille to follow the movements of the eyeball whether the lids be opened or closed. Wessely makes a plate in profile to show the position of the foreign body as regards depth and height with regard to the anterior pole. A radiogram is then taken from the front to indicate the emplacement as regards height and length. Henrard has improved the method by employing stereographic radiography in the lateral position. Wessely's method is imperfect for occipito-frontal radiography, but offers great advantages in the lateral, and becomes absolutely perfect when supplemented by the stereoscopy of Henrard.

Cheron's method consists essentially in superimposing two diagrams formed of interlacing circles representing the right and left aspect of an eye seen in profile upon two stereoscopic radiographic plates of the wounded eye. By this artifice the ocular globe becomes visible upon the negatives and these may then be examined with the stereoscope to determine, by the effect of relief and perspective, the exact situation of the foreign body as respects the eyeball. Two diagrams illustrate the method.

Francis thinks that the final diagnosis in suspected cases of foreign bodies in the eyeball must rest with the roentgenologist. The absence of a visible point of entrance is not to be relied on nor should the giant magnet be used as a means of diagnosis. The route and method of extraction should be governed solely by the location, shape and size of the foreign body. A small, roundish body with no ragged edges is best extracted by the anterior route. For others the scleral route offers the least risk. Whatever the size and shape of the foreign body, if lying against the ciliary body in such a position that there is likelihood of its becoming impacted in the ciliary body during extraction, the posterior route should be selected. The writer concludes with the description of the operative procedure to be employed.

Adams reports enucleating an eye in which all the evidence, including X-ray examination, pointed to the presence of a foreign body within the eyeball. After enucleation the steel was found to be just outside the eye, lying flat against the sclera about 6 mm. to the nasal side of the optic nerve. He thinks that no method could have made a true decision as to the location of the foreign body in this case.

Because of the profuse bleeding in wounds through the sclera in the posterior portion of the globe, it is frequently impossible to locate intraocular foreign bodies. **Herrenschwand** advises the use of the magnet in all such cases to determine the presence or absence of magnetic bodies. **Fraudet** and also **Imbert** have written on the localization of foreign bodies in the eyeball. **Perol** and **Bazin** have reported on Fraudet's method. Foreign bodies in the eye, their localization and removal was the subject of **Martin** and **Watkins'** paper. **Donaldson** writes on Sweet's method of locating foreign bodies in the eye. **Liebermann** wrote on the localization and management of foreign bodies in the orbit.

Magnet Extraction.—Extraction of intraocular magnetic foreign bodies by means of the giant magnet is considered by **Rollet**. With this instrument he has removed 230 such bodies. The diagnosis is based upon three different elements: the history of the injury and supposed composition of the foreign body, radiography and the giant magnet. The history may be deceptive, as in the case where a laborer strikes a rock with his pick and believes himself to have been wounded by a fragment of stone, when in reality the eye harbors a metallic splinter from the instrument. In this connection researches have shown a curious behavior on the part of certain metals and alloys. While nickel and steel are separately highly magnetic, nickel-steel, 25 per cent alloy, is essentially non-magnetic, and numerous other compounds present an analagous behavior. Radiography is highly important—almost indispensable—but in certain urgent cases it may be necessary to intervene without such aid. The giant magnet is capable of making the diagnosis with its pathognomonic signs: pain, forward movement of the globe, hemorrhage into the anterior chamber. The writer prefers the anterior route, employing the scleral only in exceptional cases. The operation consists of three steps: keratotomy, iridectomy and extraction with the magnet. Does the giant magnet ever fail? Based upon an experience of 230 extractions, the author has satisfied himself that by utilizing the preceding technique, every magnetic splinter fixed in the normal tissues of the eye can be extracted if the intervention takes place shortly after the traumatism. But if the foreign body has become encapsulated there may be great resistance to the magnet and its extraction be very difficult or even doubtful.

Butler considers the Mellinger ring magnet superior to the Haab. Its advantages are: First, the operation can be performed upon a recumbent patient; second, in the Haab operation the patient must be laid down when the splinter has come forward and a hand magnet employed to extract; with the Mellinger, the splinter is placed in the desired position, remains there, and is easily extracted; third, no hand magnet is required; fourth, the power of the magnet is concentrated at the center of the ring where the eye is placed, the lines of force are parallel and not divergent as in the ordinary magnet; fifth, the operation is performed upon a motionless patient with convenient rods admitting of the most delicate manipulations performed in an excellent light; seventh, the force used is under absolute and perfect control. He concludes with the statement that no unprejudiced surgeon who has experienced the ease with which splinters can be handled in the Mellinger ring will wish to revert to other magnets.

Beauvieux and **Delorme** formulate certain rules for the extraction of magnetic substances from the vitreous: First, if the patient is seen immediately after the accident, and there is a widely patent penetrating wound of the posterior segment; extraction may be attempted by the posterior route through the original wound; but this should not be done if it is necessary to reopen the wound. Second, when the lens is uninjured and there is hope of preserving vision, the anterior route is preferable; the operation of choice is extraction with iridectomy. Third, when the foreign body has penetrated into the vitreous through the lens, the anterior route must be chosen; the lens is subject to no further risk, and there is every reason for preserving the retina intact in view of the subsequent operation for cataract. Iridectomy is positively indicated in such cases.

Dor is a partisan of the scleral route in all cases where the wound of entrance has become closed, necessitating an incision of the eyeball; he prefers a small magnet to a large one; the latter causes pain and even hemorrhages into the anterior chamber. By this method he has obtained, in a fourth of his cases, excellent results with visual acuity practically equal to normal.

Clapp reports twenty-nine cases of removal of steel from the eyeball. Useful vision was obtained in ten; light perception to motion in seven; in one vision was not tabulated, and in eleven the eyes were lost. Of the cases with useful vision, six were aphakic with vision 20/50 to 20/20; seven cases were operated by the posterior route, five retaining useful vision. Average size of foreign body was 4.8 x 2 x 1; largest was 20 x 5 x 4; smallest, 1 x 1½ x 1½.

A magnetic foreign body in the vitreous was removed through the scleral route by **Hoare** and 6/6 vision obtained with correcting lenses.

Five cases with magnetic foreign bodies in the choroid and retina which were visible with the ophthalmoscope were reported by **Carrayon**. The eyes were tolerating the foreign bodies, but because of the fear of siderosis the author removed the foreign particles successfully with the magnet. The results were excellent in every case.

Shoemaker and **Scarlett** report a case of a piece of steel embedded in the sclera, localized by the X-rays and visible with the ophthalmoscope. Vision 20/50. Attempts at removal of the foreign body with the magnet had been previously made without result. The reporters tried the giant magnet to its capacity; the traction caused considerable pain, but was not sufficient to liberate the foreign body. As the damage done was comparatively small and the eye was quiet and possessed of useful vision, the reporters decided against further attempts at extraction.

In **Neeper's** case the eye had been penetrated by a piece of steel which passed through the cornea and iris and which, after localization with the X-ray, had been removed with the giant magnet through the sclera. There were bands in the anterior vitreous. He raises the question whether an effort should be made to sever these bands in order to avoid the risk of subsequent detachment of the retina.

Siderosis.—In **Murray's** case, following injury, a foreign body was recognized in the right eye; no attention was paid to the left; three days later the left eye became irritable with blurring of vision; this increased until about the fifth month, when the sight was almost completely gone. The X-rays showed a foreign body about 10 mm. back of the cornea. There had been scarcely any irritation of the eye except for the first few days following the accident. The probabilities are that the preliminary loss of vision was due to a slight hyalitis followed by encapsulation of the foreign body. Choroiditis developed, succeeded by total cataract. Siderosis bulbi followed, thirteen distinct round rust-colored spots being distributed beneath the capsule of the lens with involvement of the iris as well, the latter presenting a rusty color. The reporter was unable to account for the development of complete cataract, as the lens itself appeared not to have been injured, though the zonula may have been penetrated.

Buckley reports that in September, 1890, the eye was struck by a sliver from a steel cleaver. Pain was experienced at intervals until after the following Christmas, when the eye became quiet and remained reasonably so until April, 1919, when a persistent pain recurred. When seen July, 1919, tension was normal, iris muddy, pupil small, pear-shaped, hypopyon; scar through limbus on temporal side extending traversely 3 mm., 1½ in cornea; ciliary zone in neighborhood of scar; no light perception, nor pupillary light reflex. The eye was enucleated and a piece of steel 3 mm. long, 1½ mm. wide and ¾ of a mm. thick was found embedded in the upper anterior quadrant of the choroid. No history of sympathetic irritation was obtainable.

In **Thoma's** case the injury occurred in 1903; fifteen years later inflammation supervening made enucleation necessary. It was found that a sliver of iron had occasioned double perforation and become attached to the external surface of the sclera, the globe, completely degenerated, showed hematogenous siderosis of the iris, lens and vitreous following numerous intraocular hemorrhages and local siderosis at the site of the foreign body. **Motolese** has written on ocular siderosis.

Injuries and Foreign Bodies in the Orbit.—In the case reported by **Leplat** a knife blade had entered just below the outer end of the eyebrow and penetrated into the orbit, a year previously. A week after the knife point bent on the flat was recovered from the wound. Examination a month later showed incomplete ptosis, the eye turned downwards, diplopia beyond 35 degrees, fundus intact. Attempt at advancement of the superior rectus failed as the part of the muscle which was accessible had been converted into cicatricial tissue, which was adherent to the globe. In addition to insufficiency of the superior rectus the writer thinks that the check ligaments of the superior and internal recti had been torn, thus accounting for the downward displacement of the eye. The reporter intends to pass a double-armed thread through the stump of the superior rectus as far back as possible, and to lead the threads along the sides of the levator muscle as far as the orbital margin, where the needles are to be passed through the skin and the threads fastened to the forehead. In this way he hopes to raise the eye and to keep it in its new position by means of cicatricial bands which will form around the threads and adhere to the periosteum of the orbital margin.

An unusual injury to the optic nerve was reported by **Strebel.** The patient, a girl 17 years of age, had been injured with a pitchfork. One prong entered the right nostril, penetrated the nasal wall, passed into the orbit, where it severed the optic nerve. The right eye was blind but a paradoxical light reflex of the pupil was present in the right eye.

Ravoux has observed two instances of direct wounds of the optic nerve by bayonet thrusts without lesion of the eyeball itself. He has collected fourteen additional cases from the literature.

Jeremy and **McMullen** report a case of supposed avulsion of the optic nerve head.

A girl, 17 years of age, received a violent blow on the under surface of the upper border of the left orbit which injured the lids and produced a sudden luxation of the eyeball. When she was first seen by **Pereyra** the globe was completely dislocated from the orbit and there was a condition of blepharo-phymosis around the globe. The patient was suffering with severe pain and the vision was nil. An external conthotomy was done, and after considerable manipulation the eye was replaced and the lids sutured over it. With a pressure bandage the eye was held in place. The outcome was good and the vision returned to normal. Suture of the torn nasal tear duct is described by **Stargardt.**

A preliminary report on evulsion of the optic nerve was made by **Lister** and **Hine.** Several illustrations accompany the article. The pathological findings in five cases are given. In only one of the cases the diagnosis could be made by the ophthalmoscopic appearance before enucleation. In three of the cases the evulsion was confined to the nerve fibers and the sheath remained in contact with the globe. The authors believe that this occurs because the sheaths are elastic and give when dragged upon, while the nerve fibers, which are non-elastic, are severed at their entrance into the globe and displaced backwards.

Oppenheimer saw an insane patient who had gouged out her eye with her thumb. The muscles were severed smoothly from the globe, and stump of optic nerve 4 mm. long adhered to it. The orbital wound healed rapidly without infection. An attempt to remove the left eye was prevented by an attendant.

Stephenson presents four cases of injury to the skull shown exclusively or chiefly by the appearances of the eyes in conjunction with the history. They exclude any direct injury to the eyes themselves.

The first case was a direct injury to the vault of the skull followed by extensive subconjunctival ecchymosis. He made a good recovery after three weeks' rest in bed. There was a fracture of the anterior fossa of the base of the skull. In the second case there was retinal hemorrhage in one eye observed two weeks after the injury, which was a blow on the right side of the forehead. In the third case there was paresis of one external rectus and atrophy of the optic disc on the same side following a fall upon the forehead two months previously. In the fourth case there was paresis of the right external rectus after a blow upon the right temple. Homonymous diplopia was present. Corrective operation on the recti two years afterwards resulted in straightening of the eyes, disappearance of the diplopia and restoration of binocular vision.

A case in which a fragment of glass remained in the lid for six years was reported by **de Salterain.** A wound involving the eye and the antrum of Highmore was seen by **Krückmann.** **Zur Nedden** has written on the improvement of ocular conditions remaining after severe injuries.

Gunshot Wounds.—It is reported in **Spalding's** case a bullet from a revolver held against the right temple traversed both orbits, lodging in the left. There was excessive edema of both lids, subconjunctival hemorrhages of each eye. The media were clear in both eyes; the cornea of each eye was transparent, but totally anesthetic, both pupils widely dilated; diplopia from paralysis of the left inferior oblique. There was a defect in the visual field of the left eye which disappeared in two weeks. The ophthalmoscopic appearances were extraordinary. The papilla of the right eye was normal, but directly above it and of about the same diameter and attached to it was a circular white exudate two-thirds of the papilla in diameter. Directly below the papilla was a larger exudate, also very white and shiny. There were a few minute retinal hemorrhages in this eye only. The exudate on the left papilla was like that on the right, but smaller and only visible above. A year later the exudate in the right eye was about one-third of its former dimensions; that of the left eye had disappeared entirely. The visual field contraction noted above had gradually ceased, but there remained a "break" in reading ordinary type.

The two points of interest in this case are the ocular paralysis and the exudates in the fundus. The vision of the right eye was perfect, that of the left 20/80. It was thought best not to attempt removal of the bullet from the left orbit.

Adam has written on the treatment of orbital shot wounds.

Fleming observed a case of gunshot wound of both occipital lobes with eye trouble. There was a deficiency of the vault of the skull over a circular area 2½ inches in diameter in the mid line, the lower part of the aperture being 1 inch above the inion. At the casualty clearing station fragments of bone and metal were extracted; no later operation. The patient now complained of headache, giddiness, slight deafness on the right side and some loss of sight, though central vision was acute. The eyes presented no objective abnormality. The visual fields suggested complete destruction of the dorsal part of each visual cortex.

War Injuries.—These have been discussed from many different points of view. **Greenwood** urges that the primary treatment of war injuries should come under the care of an expert ophthalmologist rather than a general surgeon. He quotes two circulars sent out during the author's service in France, calling attention to the necessity of preserving as much of the eyelid tissue as possible, and urging accurate primary suturing of all eyelid wounds whenever practicable. The following is taken from Circular No. 1: "Orbital Injuries: A small foreign body in the orbit not easily accessible should be left unless cellulitis develops; the latter requires free drainage. Larger bodies should be removed, avoiding injury to muscles and nerves. In lagophthalmus the lids should be sutured together if there are any signs that the cornea is likely to become involved." Extract from Circular No. 2 insists upon the great importance of saving tissue in wounds involving the lids and adjacent structures. Orbital tissues also should be conserved in doing enucleations and eviscerations. Especial care should be taken in tears and wounds of the lids, particularly of the lower lid, which involve the inner angle—the most common seat of tears. Careful suturing of the conjunctiva must precede or go hand in hand with suturing of the skin angles. The majority of the penetrating wounds of the orbit are complicated by the presence of the foreign body, which becomes encapsulated and gives rise to serious consequences. Where a larger foreign body has penetrated the orbit, there is usually such an amount of destruction of tissue that the foreign body can be removed without adding to existing trauma. Careful X-ray localization should be carried out to make sure that the foreign body has not penetrated the roof of the orbit and become lodged in the brain. Perhaps the class of orbital injuries which have excited the greatest interest have been those where the bullet, passing behind the globe, or through the bony tissue surrounding it, has produced more or less severe injury to the globe by extension of the trauma without actually coming into contact with the globe itself. The war has produced a great many choroidal ruptures, macular holes, hemorrhages, severed optic nerves and other interesting ocular findings. Quite a proportion of men have been blinded by the passage of high-velocity bullets through the orbital apices. For these little can be done.

Jess observes that in contrast to peace-time injuries, war-time foreign bodies are usually jagged and irregular in form; their magnetic quality is dependent on the material used in making the shells, grenades, etc., from which they come. Not all foreign bodies are magnetic or even metallic, as the war caused a large number of injuries by pieces of stone, grains of sand and splinters of glass and wood. If the condition of the eye is not such as to permit an ophthalmoscopic examination, roentgenography should be used to determine whether or not the object is within the eye, in spite of the possible danger of injury by X-rays to the eye or neighboring structures. The author describes several methods of determining the position of the foreign body either by specially constructed apparatus or by observation of the position of its shadow when the eye is turned in different directions. Even with the best method and the greatest care particles were sometimes not found, as many of them were very minute, a characteristic of the war. The sideroscope should be used in such cases, although it merely proves the presence of iron and not its location in the eye. The giant magnet should also be used, the presence or absence of pain being a strong diagnostic aid. Since siderosis develops more rapidly in war wounds than in peace, early removal of the foreign body is imperative. This is more difficult than in peace injuries because the terrific force of the penetration often imbeds the particles in the tissues, which is aided by the jagged outlines.

Witham writes an interesting paper upon military ophthalmology. Numerous case histories are given. The paper should be consulted in the original.

In a case of a soldier wounded in the left cheek by a fragment of shell, **Rousseau** noted, three hours after the injury, an uncertain history of blindness lasting several days, concentric narrowing of the visual field, and, ophthalmoscopically, a peripapillary hemorrhage and pigmentation with dilatation of the veins and hyperemia of the papilla. Operation resulted in removing a voluminous projectile weighing 30 grams and measuring 16 x 12 mm. from the orbit. This large projectile had evidently traversed the left antrum and nasal fossa and remained in the orbit without exciting septic complications. The ophthalmoscopic appearances pointed to a hematoma of the sheaths of the optic nerve explicable as follows: Contusion of the nerve far back of the globe across the internal rectus by the projectile. The contusion must have been relatively slight, as shown by the improvement of the visual acuity and the fact that the muscle, directly injured, recovered its function. It seems that the blood effused into the sheaths of the nerve originated at the point of contusion and extended forward where it was visible with the ophthalmoscope in the form of pigmentation and a flame-shaped hemorrhage. It is hardly possible that the hemorrhage should have originated in the retina itself, seeing that the projectile was relatively far from the globe and of slight velocity, for if there had been a fracture of the thin internal wall of the orbit, the injuries to the internal rectus and the optic nerve itself were evidently very slight.

Maxted analyzes 106 cases of perforating wounds of the eye in soldiers. In 58 the left eye was penetrated and in 48 the right. In 24 a foreign body was removed with a magnet; of these, 4 were subsequently enucleated, 6 regained some useful vision, the other 14 were blind but remained quiet. Of the remaining 82 eyes, X-ray examination of 48 gave a negative result in 14 and positive in 34, of which the foreign body was extraocular in 12 and intraocular in 22. Of these 22, the eye was enucleated in 9; of the remaining 13, in 9 the eyes were quiet with light perception only and mostly with low tension. One died, leaving 3 eyes containing nonmagnetic foreign bodies with vision from 3/60 to 6/9. In 7 cases where the foreign body had penetrated both walls of the globe and was lying in the orbit, no eye had to be enucleated, but the best vision was fingers at 3 feet. Seat of perforation wholly within the cornea 36, limbus 37, sclera 28, not mentioned 5. Of the 36 corneal perforations, 14 had vision between 6/60 and 6/6. Of the 37 corneo-scleral perforations in 7, the vision was between 6/60 and 6/9. The lens was injured in 44 cases; a definite Vossius ring was noted in 1 or 2 patients. Fifty cases showed prolapse of the iris; enucleation was performed in 25 cases. There was one instance of sympathetic ophthalmia. Only one other case occurred in this hospital out of several thousand eye casualties admitted from abroad.

Aubaret has written on lesions of the lacrimal apparatus from war injury, and **Adam** on the treatment of orbital gunshot wounds. **Beykowsky** has recorded his experience in wounds due to the explosion of mines, and **Zimmermann** has written on injuries to the eyes through explosion. **Seefelder** takes up the treatment of ocular war wounds in the home, and **Kretschmer** eye injuries in the war. **Hogue** read a paper on eye surgery in the war. **Fort** reported two cases with eye injuries, and **Trebilcock** discusses eye injuries in general.

Pathology

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This review of the subject carries the literature from July, 1919, to December, 1920. For previous references, see A. J. O., v. 2, 1919, Dec., p. 295.

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DIGEST OF THE LITERATURE.

Heredity.—In the study of heredity, **Fisher** believes that the eye color is the only normal human trait which is certainly Mendelian in the great majority of cases. He suggests a tabular form for recording information of a single family, and classifies the types into simplex, meaning complete absence of yellow or brown pigment in the iris; and duplex, meaning its presence, as in black, brown and hazel eyes.

A correction of formerly published tables and additional data on the hereditary factor concerning eye color was published by **Ewart.** The analysis of fresh material strengthens his former conclusions. (Oph. Y. B., v. 14, p. 217; A. J. O., Nov., 1918). **Boas** has also written on the heredity of the color of the eyes in man.

A woman, 47, consulted **Peters** for refraction. He noticed after examination that both of her lower lids were dark in color, due to a fine deposit of yellowish-colored pigment. He was able to trace the condition through several members of the patient's family over a period of five generations. Only the brunettes of the family were affected.

In the examination of 1,000 recruits, **Vogt** found cortical opacities of the lens, without visual impairment, in 20 per cent. He was able to trace a similar condition of the lens in many of the families of the affected men. The author believes that many of these cases are hereditary, and of the homochrome type (making their appearance late in life). The author suggests the more careful taking of the family history in cataract cases, to determine how frequently a hereditary condition exists in these cases. **Hilton** has written on the bearing of hereditary blindness on marriage; and **Howe** on the relation of hereditary eye defects to genetics and eugenics.

Transmission of Defects Due to Sensitization. To explain experimental results, **Guyer** and **Smith** theorize that if the serum of one species of animal can be so sensitized to a given tissue or tissues of another species, that it will become toxic or lytic for the tissue in question, and that a constitutional identity exists between the mature tissue substance and some of its material antecedents in the germ, the latter may be influenced specifically by the sensitized serum. To prove their theory they used the serum of rabbits that had been sensitized to rabbit lens. Antenatal lens defects appeared in the offspring of pregnant rabbits so treated.

The interesting feature is that with the defect once secured the anomaly can be transmitted through successive generations. It is transmitted through the male line. Unrelated normal females can be mated with defective males and have offspring with lental defects. In the authors' experiments it has been passed through six generations to date. They conclude that the defects are transmitted only through the germ cells of the male and that it, therefore, is an example of true inheritance. These experiments illustrate that the blood can convey modifying influences to the germ cell and produce hereditary defects. This might upset the existing theory that the stability of good stock can not be damaged through acquired blood changes.

Histology of Senile Eye Changes.—An extensive study of the histologic changes which occur in senile eyes was made by **Monauni.** The principle changes which he found were fatty and calcareous degenerations, diminution of elastic elements and an increase in hyaline substance.

In arcus senilis he found a deposit of fat and calcium in the tissues and degenerative changes in the peripheral portion of Bowman's and Descemet's membranes, with the deposit of hyaline bodies. In the lamina vitrea hyaline degeneration forming the so-called warts was characteristic. The muscle and epithelium of the ciliary body undergo fatty degeneration. In gerontoxon lentis fat was found. A marked fatty degeneration of the zonular fibers was noted, and the author believes that this might explain the frequency of luxation of the lens in senile eyes. Calcium salts, cholesterin and other crystals were common in the vitreous.

Toxins and Healing of Wounds.—An interesting experimental study of the effect of bacterial toxins on the cicatrization of eye wounds was carried out by **Guglianetti.** After producing aseptic wounds in the cornea of rabbits, diphtheria toxins, the toxins from B. typhosus and from virulent streptococci were injected subcutaneously and intraperitoneally in one series of animals. In the second group the toxins were injected subconjunctivally or instilled into the conjunctival sac. In the first series no reaction was observed excepting in the severely intoxicated animals, where cicatrization was slightly retarded. In the second group violent conjunctivitis, keratitis and iritis were observed and healing of the wound was slow and irregular. Retarded cicatrization was most marked when the diphtheria toxin was used.

Anaphylaxis.—It is suggested by **Aubineau** that spontaneous and recurrent hemorrhages, which occur during the period of adolescence are probably due to anaphylactic changes in hemophilia.

Transmission of Herpes.—Experimenting on rabbits, **Löwenstein,** using material from the vesicles of herpes of lip, chin, forehead, etc., was able to produce a corneal eruption similar to human, herpetic keratitis. There was cystic degeneration of the epithelium, forming vesicles, destruction of Bowman's membrane and the surface of the parenchyma and deeper infiltration with leucocytes. Seventeen rabbits thus inoculated were similarly affected. With other vesicles from burns, eczema, pemphigus and herpes zoster, the results were negative.

General.—An outline of the course on anatomy and pathology of the eye that was given by **Fuchs** at Madrid, was published by **Marin Amat. Munoz Urra** has described in detail a method of making stereoscopic plates from microscopic slides. Light is supplied to the object in two pencils which fall upon it more or less obliquely. The body of the microscope is replaced or extended by a camera at the upper end of which the photographic plate is exposed. The work done by this method is illustrated by numerous reproductions of the photographs, some of which very strikingly show the relative depth of different structures in the specimen. Some of the illustrations show iris, choroid, retina, intra-ocular tuberculosis, carcinoma of lid, fasicular degeneration of choroid and various other ocular conditions. Striking stereoscopic effects are also obtained with ultra-microscopy.

General Diseases

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This review of the subject carries the literature from October, 1919, to December, 1920. For previous references, see A. J. O., December, 1919, p. 299.

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DIGEST OF THE LITERATURE.

Relapsing Fever.—The paucity of literature referring to the ocular complications of relapsing fever has lead **Trantas** to an extended review of the subject, based largely upon his own experience. During the period of fever there is congestion of the eyeball, especially of the outer third of the bulbar conjunctiva. There may also be pericorneal redness, conjunctival discharge which contains organisms resembling the spirilla. In two cases he observed conjunctival hemorrhage, and in a third this condition accompanied iridocyclitis.

Corneal lesions are frequent, they were found in twenty-three out of fifty cases especially examined for them. One or both eyes may be affected. Among nineteen cases they appeared in two during the first recurrence of the fever. In six, during the first interval between the primary attack and the first relapse; in eleven between the first and second relapse. The usual location and form of this lesion are indicated in Fig. 26, in which the depth of the lesions is also indicated, the deeper being lettered (a) and the more superficial (b). Some of the latter disappear in a day or two, having only a brief period during which they take the stain of fluorescein. In contrast with these Trantas gives diagrams of the lesions of the cornea seen in measles, erythema polymorphe, small-pox, chicken-pox, malarial fever and syphilis.

the ciliary region is the most common. Subacute and chronic cases are marked by impairment of vision due to vitreous opacities. In a few cases the deposits on Descemet's membrane constitute the only evidence of the lesion. In three of his cases the retina was involved.

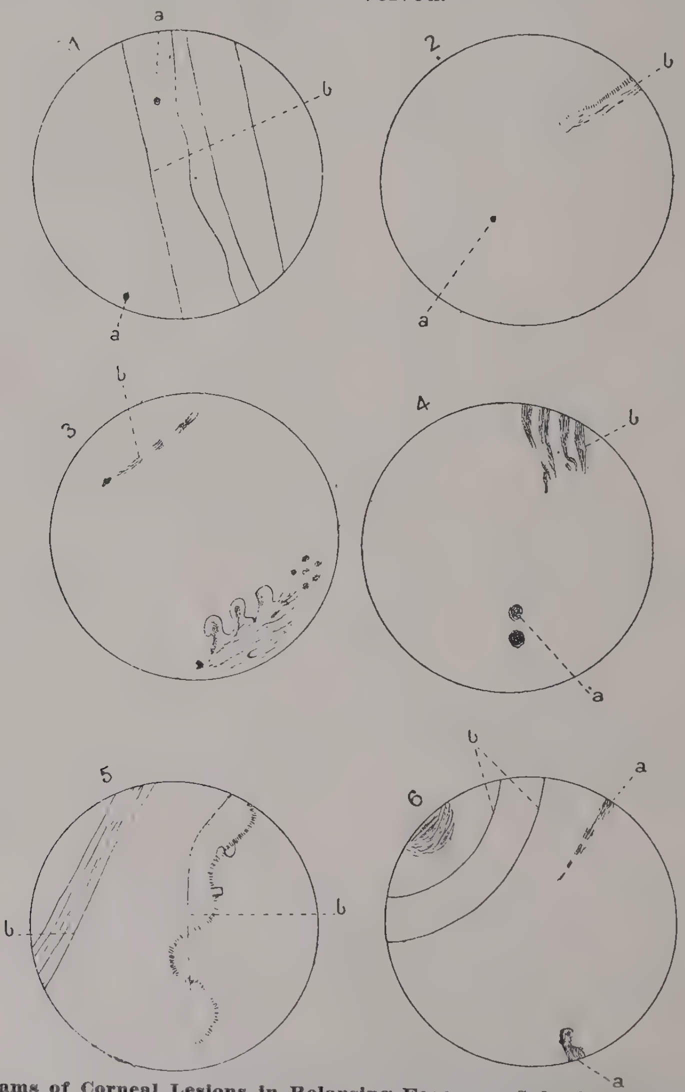

Fig. 26—Diagrams of Corneal Lesions in Relapsing Fever. a. Subepithalial Parenchymatous Lesions. b. Superficial Lesions Colored by Fluorescein.

Lesions of the uveal tract constitute one of the important complications. Among 220 cases treated in the military hospital there were encountered eight, details of which are included in the paper. Iritis with synechiae was rare, cyclitis shown by excessive tenderness from pressure on

In addition to the above the following cases, presenting ophthalmoscopic lesions, are reported: One was of hemorrhage in the periphery of the retina; one of latent chorio-retinitis and another of chorio-retinitis with the formation of large plaques. There was also one of retinitis proliferans, and one of dust-like opacities in the vitreous, which reduced the vision to one-third, but presented no other evidence of uveal involvement. In addition to the above, five cases are briefly reported as seen in private practice. All had suffered from some uveal inflammation, and exhibited vitreous opacities.

Typhus Fever.—Following an epidemic of typhus, Marin Amat encountered a series of cases which he regards as ocular manifestations of that disease. They were eight in number and included detachment of the retina, post neuritic atrophy of the optic nerve in one eye, and slight optic neuritis with central scotoma in the other; post-neuritic optic atrophy in both eyes, and vision reduced to one-tenth, in one case and a similar lesion in another case reducing vision to R. 1/12 and L. 1/6. In one case, seen three months after the fever, there was complete atrophy of both optic nerves apparently primary. (See also p. 210).

In one case there was atrophy of the eyeball following serpent ulcer of the cornea during convalescence from typhus. The other eye had been lost by inflammation in infancy. In another case both eyes had been greatly damaged by serpent ulcer. One patient had a central leucoma following serpent ulcer in one eye. Iridectomy gave useful vision. Marin Amat concludes that these ocular manifestations of typhus are relatively frequent. They are due to high temperature and subsequent debility, and to the toxins of the specific organism, and offer an added reason for the prevention of this disease. To the above list **Gonzalez** adds episcleritis and scleritis, uveitis, acute glaucoma, amblyopia, paresis of accommodation, paralysis and contractures of the extrinsic ocular muscles and congenital zonular cataract.

Typhoid Inoculations. — The eight cases of ocular complications due to typhoid inoculations which he has encountered in military and private practice, are brought together by **Calhoun,** who also refers to ten papers on the subject by eight other writers. He concludes that the causative factor is an endotoxin derived from the antityphoid vaccine, this view being supported by disturbances of similar origin in other organs. There is some analogy between these and the reactions following the use of tuberculin and of arsenical preparations.

Lethargic Encephalitis.—In the past year this has been the subject of more papers, both in ophthalmic and general medical journals than any other ocular condition. The indefiniteness of its symptomatology referred to a year ago (A. J. O., Dec. 1919, p. 303) has not been cleared up by later contributions. A good picture of it is given by **Woods,** who reports seven cases. He says: "The disease is characterized by insidious onset, lack of symptoms of an infectious nature, stupor and involvement, sometimes paralysis of various muscles, but chiefly the muscles of the eye or face. The ocular symptoms consist of either relative or total paralysis of the intrinsic or extrinsic muscles, ptosis and nystagmoid movements. One or several of these symptoms may be present. The ocular symptoms have a definite tendency towards spontaneous recovery."

Patton finds that the severity and diagnostic importance of the ocular symptoms varies in different groups of cases and in different localities. In review of 115 cases, including fifteen of their own, **Dunn** and **Heagey** refer to what they call the diagnostic triad, ocular symptoms, somnolence and negative or atypical findings in the spinal fluid. **H. A. Calhoun,** from a study of the histopathology of the brain, in a fatal case which followed influenza, concluded that the condition was a clinical syndrome caused by lesions of various types. It includes cases of epidemic encephalitis resembling the African sleeping sickness.

The extremely variable course of the disease is pointed by **Achard.** Not only do different cases present different groups of symptoms, but they present them in very different order. He reports a case in which, after a week of somnolence came a period of active talkativeness, then there was a week of fever and headache, and after that paralysis of one oculomotor nerve. **Netter,** who saw twelve cases, thinks the most constant symptoms are fever, somnolence and paralysis of the eye muscles. Recrudescence is very apt to occur. Among ten cases reported by **Skervsky** there was fever in nine, and disturbance of the ocular movements in seven.

Hammes calls attention to extreme photophobia, although when the eyes were opened the pupil seemed normal. **Boyd** found the ocular symptoms were diplopia, impaired accommodation and disturbance of vision, all fleeting in character.

Dunn and **Haegey,** among their 115 cases, found palsies of the third nerve in sixty-six, and of the abducens nerve in forty, the fourth nerve was affected in only two doubtful cases. Ptosis occurred in twenty-nine, and loss of the pupil reflexes in sixteen. Diplopia occurred in all **Spaeth's** five cases and all complained of blurring of vision. **Winslow** thinks the eye palsies the most distinctive symptom, but they do not appear often for a week after the onset.

Bollack found ptosis in thirteen cases out of twenty, all but one being bilateral. There were nine cases of strabismus, six divergent, three convergent. Only three cases were free from nystagmus; seventeen cases showed paralysis or paresis of accommodation. Visual acuity was generally normal, and no ophthalmoscopic changes were mentioned. **Buzzard** reported twelve cases, in six of which diplopia was a prominent symptom, while in three ptosis was added. **De Lapersonne** points out that the ocular palsies may be fleeting and migratory. **Pfingst** noted paralysis of accommodation so that four of his six patients could not read ordinary print. He saw no neuro-retinal changes. **Woods** saw optic neuritis in one case. In **Hershberg's** case brain tumor was ruled out, largely because of the absence of ophthalmoscopic symptoms. **Walker** concludes that lesions of the optic nerve are not a manifestation of the disease. **Dunn and Haegey** found retinal changes mentioned in twelve cases. **Lacroix** and **Pesme** attempted to discriminate between typical and atypical cases, and report ten of the latter but none of the former. The symptomology has also been reviewed by **Vinsonneau, Sauvineau, Dor, Menacho** and **Denechau.**

Dickinson emphasizes the importance of discriminating between lethargic encephalitis and syphilis, illustrating the difficulties of so doing by two cases. **Flexner** thinks the outstanding obligation with regard to this disease is a close study of suspected cases in order to determine their real nature. The editor of the Maine Medical Journal thinks any physician encountering a case should have in consultation an expert oculist to judge of the significance of the ocular symptoms. Although the disease is supposed to be communicable, **Flexner** points out that usually but a single case occurs in a family. And although the inoculation of monkeys with production of the same disease is reported, this leaves room for confirmation.

The prognosis is extremely uncertain, disturbances of ocular movement may disappear in a day or two or last for many months. **Sedwick** demonstrated a case in which, although the squint had greatly diminished, at the end of three and one-half months the patient at once went to sleep when conversation with him was discontinued. **Bond,** who saw five cases in a hospital for the insane, reports that one died, but the other four were restored to much the same condition as they had been in before the attack. **Barker, Cross** and **Irwin** discuss the general character of the disease. Case reports or more extended papers on lethargic encephalitis have been published by **Cords, Economo, Hala, Juarros, Lereboullet** and **Mouzon, Mety** and **Michel, Ronchetti, Sicard** and **Kudelski, Smith, Stradiotti** and **Monti, Tanaka** and **Zoja. Crookshank** has written on epidemic encephalitis and influenza.

Influenza.—It is pointed out by **Augstein** that the recent epidemic cast serious doubt on the connection of the so-called influenza bacillus with this disease, other organisms being usually found with or without the bacillus. The proportion of cases showing ear and eye complications is small as compared with the total number of cases. He mentions inflammations of the lids, abscess of the orbit which may arise from disease in the sinuses, corneal suppuration with panophthalmitis and metastatic panophthalmitis, optic neuritis, neuritis and retinal hemorrhage, glaucoma uveitis and hemorrhage into the anterior chamber.

Among 103 fatal cases, **Frenkel** saw hemorrhage within Tenon's capsule in six and hemorrhage in the retina or vitreous in twenty-four. There were also two cases of hemorrhage in the choroid and one into the head of the optic nerve. **Fernandez** saw six cases of iritis. One of these patients was left with optic atrophy and another with optic neuritis not entirely cured. **Hessberg** found corneal lesions especially severe, but amenable to treatment. Uveal complications yielded less favorable results. **Beltras** has reported amaurosis following grippe, and **Zimmermann** has written on its ocular complications, and **Bresler** on those of this disease and diphtheria.

Cerebro-Spinal Meningitis. — The ocular complications of cerebro-spinal fever were studied by **Sinclair** in two epidemics, one occurring about Ipswich and the other near Harwich, England. In the former there were 104 cases, in all, of which the meningococcus was found. In the latter there were twenty-four cases. Eighty-six of the patients were adults and forty-two were children under 12 years of age. Among the adults metastatic ophthalmitis occurred in but one patient, which approaches the 1.4 per cent among 502 cases reported by Rolleston. But among the children there were six cases, more than 15 per cent. The metastatic case of the adult was rapidly fatal. Among the children only one died, a baby 4 months old. In only one case was the ophthalmitis bilateral, and in the other cases the retained eye showed no optic neuritis. Convergent strabismus appeared in eight cases, all of them adults. Mucopurulent conjunctivitis was seen in two cases, a mother and her baby, who both died. The meningococcus was not found. One case ended in dense opacity of more than half the cornea.

One patient, a sturdy girl of 11, came complaining she could not see with her right eye, which was slightly congested, but the anterior chamber was three-fourths full of greyish-yellow exudate. Lumbar puncture revealed the meningococcus in the spinal fluid. Although the eye was thus lost, there were no general symptoms but trivial headache and slight malaise. Sinclair points out that the meningococcus has been repeatedly found in eyes enucleated for pseudoglioma where there was no history suggestive of meningitis. In the discussion, Hine mentioned a case in which there was proptosis of the right eye. It was rapidly fatal and the post mortem showed an abscess around the cavernous sinus. Mackay told of a soldier blind in both eyes, who was the only survivor of forty-three men attacked by the disease in one camp.

Botulism.—Four men who suffered the symptoms of botulism after eating a can of smoked trout, were seen by **Saint-Martin.** They suffered from amblyopia and persistent congestion of the optic nerve and retina, which was still evident six months afterward. There was also contraction of the visual field, and persistent asthenia and torpor. Botulism with unusual sensory symptoms was reported by **Boeheim.**

Bacillary Dysentery.—After a review of the literature pertaining to the ocular complications of dysentery, **Kiep** reports his observations on nineteen cases, all but one of which had arisen among British troops in the Balkans. Ten were infected by the Shiga bacillus, two by the Flexner bacillus, one with both the above, one with the Shiga bacillus and another bacillus, while in five the infection could not be satisfactorily determined. Conjunctivitis, mucopurulent in character, occurred in one patient infected with the Flexner bacillus. It lasted about a week, and later iridocyclitis developed. Some form of uveitis was seen in five cases. The lighter cases lasted nearly a month and one of the patients suffered five relapses in two years and another three, in fourteen months. In both of these cases the organism found was the Flexner bacillus.

Sporotrichosis. The ocular lesions of this disease are the subject of a paper by **Moure.**

Hereditary Syphilis. — The ocular symptoms were carefully sought and noted by **Green** in 100 cases of hereditary syphilis. In every case the clinical diagnosis was confirmed by a blood Wassermann of at least + 2, and in forty-eight cases a spinal fluid Wassermann was also taken. Forty-eight were boys and fifty-two girls. Nine showed inequality of pupils, in nine the pupils barely reacted to light and in three were fixed. One patient showed marked hippus. Six had strabismus, one ptosis, and three nystagmus, nineteen had evidences of parenchymatous keratitis, seventeen being bilateral; four had mild iritis, in two of which the aqueous was slightly turbid. The lens was clear in ninety-nine, while one had a small posterior polar opacity. Two presented a fine haze in the anterior part of the vitreous.

Fifty-two presented lesions of the eyeground; thirty-seven showed none, but in some of these the cornea was too opaque to permit their discovery. The fundus lesion, most commonly seen, was a punctate pigmentation; twenty-eight cases. Tiny dots of brown or nearly black pigment are strewn rather evenly in the retina, being usually confined to the peripheral portion. In three cases there were similar dots of depigmentation. In several, larger whitish areas surrounded by gray pigment with a pigment dot in the center, were observed. Masses of gray pigment, alternating with depigmented areas, were observed in four patients, and disseminated retinochoroiditis was observed in two. One showed sclerosis of the choroidal vessels around the optic disc, one a punctate neuroretinitis with swollen nerve heads, and one minute retinal hemorrhages and another appearances suggesting antecedent hemorrhage. Three showed perivasculitis.

The optic nerve head was very frequently hazy, in nineteen it was noted as pale. Eight showed optic neuritis and a much larger number some hyperemia of the disc. Eight suffered from optic atrophy; bilateral in six, and total in five. Green is convinced that the dark brown punctate pigmentation is absolutely characteristic of hereditary syphilis, and may be its sole expression. He gives a case in which it was found in a boy of five examined for symptoms of meningeal irritation. The child and his father gave positive Wassermann, and the former promptly recovered under neosalvarsan and mercury.

Cantonnet adds to the Hutchinson triad (the notched teeth, parenchymatous keratitis and deafness) a chronic hydrarthrosis of the large joints, especially the knees, as a symptom of inherited syphilis. **Jeans** has written on cerebrospinal involvement in hereditary syphilis.

Syphilis, Diagnosis and Treatment.—No heed should be paid to a negative Wassermann reaction, according to the observation of **Roorda Smit.** He found the blood Wassermann constantly negative in twelve out of fourteen cases. In two of these the syphilis ran an insidious course but flared up with an intercurrent infection. The diagnosis was confirmed by an improvement under mercury. **Dimitry** calls attention to cases of tabetic optic atrophy in which adominal operations had been practiced because lues had not been suspected. **Torres Estrado** reports six cases of typhus accompanied by ocular lesions closely resembling those of syphilis. Four became blind with optic neuritis, and in one, after having been totally blind, considerable vision was recovered under mercury and iodid. He has seen similar cases of optic neuritis following influenza and yielding to antisyphilitic treatment. **Schoenberg** urges routine, periodic ophthalmologic examination of every luetic, from the beginning of infection throughout his entire life, to learn the frequency, the time of appearance, and types of optic nerve lesions in this disease. By watching for changes in the cranial nerves, valuable information, regarding the future of the nervous system of the individual can be obtained, and methods of treatment can be more intelligently applied. When involvement of the optic pathways occurs in luetic persons, the ophthalmologist should exclude other factors such as chronic sepsis, focal infections, intoxications, trauma, etc., which might be the sole etiology, or associated with the syphilis in producing changes in the optic pathways.

When neuroluetic changes are present, one should make frequent and accurate studies of the blood and spinal fluid. A negative blood Wassermann reaction does not exclude neurolues. A positive Wassermann of the spinal fluid means active or latent lues of the central nervous system. In addition to the Wassermann test of the spinal fluid the globulin and cell content should be ascertained and the Lange, or colloidal gold, reaction determined. The author classifies the various types of lesion and discusses the prophylaxis and treatment for them. Nine cases are reported in detail. They portray the different types of the disease and exemplify the course of each under the old and new methods of treatment.

The book of **Igersheimer,** over 600 pages, gives the most complete account of syphilis in relation to the eye that has yet been published. He insists that the use of all possible diagnostic resources is the only basis for successful treatment, to secure the arrest of processes that would otherwise destroy a certain essential part of the nervous system. He devotes more than one-third of this treatise to neuro-syphilis, but parenchymatous keratitis and uveal lesions receive thorough consideration. Disturbances of the pupil and motor ocular nerves are also carefully considered.

A review of very much the same ground, but much more condensed, is given by **McCaw** in 36 pages, with special topics rendered directly available by cross references. He emphasizes the remarkable progress of our conception of syphilitic infection made in recent years, and discusses primary syphilis of the eye, where the sore presents the same characteristics as elsewhere. Corneal and uveal lesions, including chorio-retinitis, are given a leading place in the practical aspects of this disease. Although syphilis of the centers and motor nerves may be equally common and serious, its treatment is approached from clinical standpoints other than that of the eye.

Among 100,000 cases of eye disease, **Martens** finds the primary lesions of syphilis, if extra-genital, occur most frequently in the lower culdesac of the conjunctiva, the lower lid, or at the inner canthus. Among tertiary lesions he calls special attention to pseudotumors, infectious granulomata, of the orbit. **Hardy,** writing on the reactions of the ocular apparatus as assisting in the recognition of syphilis, finds that uveal lesions make up over 43 per cent and paralysis of the ocular motor nerves 18 per cent. He finds that undue reliance on the negative Wassermann test causes the nature of such eye lesions to be overlooked.

Harkness insists on the importance of the specific treatment with mercury, iodides and salvarsan. Early adequate treatment, he thinks, would prevent nearly all serious eye lesions. **Hansen** finds that salvarsan has its best effects on iritis and iridocyclitis. With mercury and iodides it helps parenchymatous keratitis. For muscle palsies it is no better than mercury, and in optic nerve lesions is even less effective. **Herrenschwand** reports, as a coincidence of tuberculous and luetic infection, a case in which a papule of the iris appeared where two typical tubercles had been absorbed under tuberculin treatment. Under antisyphilitic treatment the papule subsided, leaving a circumscribed atrophy of iris tissue. Five months later this part of the iris again presented typical tubercles, accounted for on the supposition that it was the point of least resistance. **Perrin** calls attention to syphilitic ocular complications in typhus.

The use of the silver salvarsan soda compound is urged by **Naegeli** for the treatment and diagnosis of syphilis. Jaundice, following the treatment of syphilitics with arsenobenzol, is the subject of a paper by **Chevalier** and **Paillard.** They find it is of frequent occurrence following such treatment and should be expected after fatigue, digestive disturbance, loss of weight and rheumatoid pains. It is generally benign. Its pathogenesis is not well defined. Attention should be paid to it, but it does not require complete cessation of the specific treatment.

Piper has written on syphilis of the eye; and **Possek** on the treatment of luetic eye disease. **Colombo** contributes to the literature on the study of ocular syphilis in man, **Grütter** on juvenile paralysis with miliary gummata in siblings, **Steinert** on congenital ocular syphilis, and **Young** on the treatment of ocular syphilis. **Kearney** has a general paper on the eye manifestations of syphilis, and **Kerr** has written on juvenile tabes with eye lesions.

Tuberculosis.—In treating of the diagnosis of chronic intraocular tuberculosis, **Stark** concludes that the mode of transmission must be through the blood stream, the lodgement of the bacilli occurring most frequently along the veins. While finding of the bacilli is conclusive, the failure to find them is not. The histology of the lesions is sufficient evidence of their nature, but Stark feels the history of the case is never complete without testing the patient with subcutaneous injections of tuberculin.

In the clinical diagnosis the onset of lesions is often quite insidious, but they may follow trauma. He mentions two cases of choroiditis with such a history, and one in which iritis cleared up quickly after extraction of a tooth with an apical abscess; but recurred a month later, and gave a focal reaction to tuberculin. Scleritis is frequently tuberculous, possibly in the majority of cases. The cornea is disposed to become cloudy in tuberculous lesions, and small opaque spots developing without signs of active disease, should suggest it.

He finds the iris more commonly involved than any other part of the eye, if we are to judge by the literature. Vitreous opacities are of various types, arising either from hemorrhage or hyalitis. In the retina involvement is more confined to the vessels, giving rise to hemorrhage and ending in white exudate. Most of his cases of choroidal involvement have had lesions far forward. Papillitis, with several diopters swelling, has followed diagnostic injections of tuberculin.

With reference to such injections, Stark recognizes four classes: Cases with evidence of lung lesions and daily fever should not receive tuberculin. Those with recent lung activity but normal temperature, may be given a dose of 1/500,000 mg., doubled until reaction occurs. Patients without activity of the disease for several years may receive 1/10,000 mg. and have the dose doubled until there is a reaction. Patients who give no history of previous tuberculosis may begin with 5/10 to 1 mg., followed each 48 hours by 2, 3 and 5 mg. Patients improving with small diagnostic doses of tuberculin may be regarded as tuberculous. While a combination of local, focal and general reactions is most positive, it is not essential to a diagnosis, which may rest upon a therapeutic test.

In discussion, Finnoff classified chronic inflammatory diseases of the eye (excluding the conjunctiva) into those due to syphilis, tuberculosis and focal infection, the latter being the most difficult to exclude. He thinks the reaction that is of positive value to tuberculin injection is the focal.

The importance of regarding tuberculosis as a focal infection is urged by **Jackson.** The view that most persons have been infected with tuberculosis at some time, and that the majority recover without knowing it, and the established cases that have exhibited active foci throughout the greater part of a long life, make it reasonable to assume a focus of previous infection whenever clinical evidence of ocular tuberculosis arises. He holds that the only effective defense that stands between health and generalized tuberculosis is tissue immunity. Toward understanding and building up this immunity our efforts must be directed.

From his experience of tuberculosis of the eye in the army, **Stark** concludes that the loss of immunity by excessive exercise, mental strain or disease, was responsible for relighting the old infection. He reports eight cases showing the benefit of tuberculin treatment, but points out that owing to the limited time this was continued, relapses should be looked for.

In an eye supposed to present sarcoma, reported by **Snellen,** histologic examination showed intra-ocular tuberculosis, causing an ectasia. **Boez** and **Duhot** report on the comparative results of use of the Calmette and Massol antigens in the tuberculous. They conclude that the greater frequency makes it a method of diagnostic value.

From her report of six cases, **Curioni** draws the conclusions that for the tuberculin treatment a sharp line is to be drawn between cases in which the process seems to be local, and those in which the ocular tuberculosis is secondary to pulmonary lesions. In the latter class tuberculin must be used with extreme caution, and in the presence of active pulmonary tuberculosis its use should be limited to subconjunctival injections. A decided and lasting reaction must be avoided, local and transient reactions may accompany beneficial effects. The choice of the preparation is not important. But exact dosage with it is. The selection of the proper dose is the chief difficulty. A dose of 1/100 of a milligram is the largest to begin with. Tuberculin is the treatment of choice, but the best results are obtained from patients kept in good general health.

Spring urges the value of tuberculin therapy in ophthalmology, in cases not generally recognized as tuberculous. A marginal blepharitis which had resisted local treatment in a patient with a positive von Pirquet reaction, yielded to the tuberculin treatment. Another, with recurring styes, and a third with phlyctenular conjunctivitis, were also greatly benefited. He found an interval of fourteen days between the doses was quite as good as one of half that time.

Franke has written on the treatment of scrofulous and tuberculous eye diseases, reporting summaries of eight cases, with beneficial results attained by the method of Ponndorff; inoculation with mixed tuberculins, repeated after three or four weeks. **Kraupa** reports beneficial results in tuberculous affections of the eye, especially severe scrofulous conjunctivitis, corneal lesions, and scleritis, from injections of milk. **Betti** has written on ocular tuberculosis and **Gonzalez-Alvarez** on cerebral tuberculoma with ocular symptoms.

Malaria.—Among 12,000 cases of malaria, **Manson** found that after practically every attack a slight icteric tinge of the conjunctiva was visible in the lower retrotarsal fold and extending on to the bulbar conjunctiva. Of the sequels of malaria, ulceration of the cornea is a most frequent, although it is not very common. It is never seen with the primary attack, but appears after from 20 to 50 paroxsyms. The parasite in these cases was always of the benign tertian type. The lesion starts with a bleb, followed by a streak of ulceration that becomes branching. Atropin is the most important local remedy.

Intraocular hemorrhage he found very rare; only two cases among the 12,000. Both of these were of the malignant tertian type, and in one of them both eyes were affected. He saw three cases of ocular motor nerve lesions after definite malarial attacks in men previously healthy, free from syphilis. One was paresis of the external rectus which greatly improved under antimalarial treatment. Another was paresis of accommodation, which recovered completely. A case of total ophthalmoplegia did not recover. There were two cases of quinin amaurosis following doses of at least 80 grains.

Actinomycosis.—A case of actinomycosis, reported by **deLapersonne**, began with a fistula of the cheek, thickening and induration of the lower border of the orbit and exophthalmos. A month later the patient had erysipelas of the face, followed by improvement in the original condition, but also by optic atrophy of that side. The nasal sinuses appeared to be normal.

Defective Nutrition.—The absence of vitamins from the diet is considered by **Viusa** as the cause of certain ocular lesions. He takes up especially xerophthalmia and keratomalacia, and calls especial attention to the triad of epithelial xerosis, keratomalacia and essential hemeralopia. In accord with this view the therapeutic indication is the administration of food containing the required elements.

Polycythemia.—Studying cases of polycythemia with especial reference to the pressure of the cerebrospinal fluid, **Böttner** found that the occurrence of eye lesions seem to be associated with increase of intraspinal pressure. Among four cases in which the pressure ranged from 210 to 270 mm. of water, he found no intraocular changes except that the veins were dark and slightly over filled. But in two cases in which the intraspinal pressure ranged from 370 to 540 mm. of water, there was marked choking of the optic nerve heads. The swelling amounted to 1.5 to 3.5 D. The veins were dark, dilated and tortuous. These patients suffered from migrainous attacks. He believes they were late cases, reaching an end condition with choking of the venous circulation and cardiac loss of compensation.

Friedenwald reports a case of polycythemia vera in which the red blood cells numbered 6,400,000. The patient was a man of 29, who complained of impaired vision, which later improved to 20/12. The ophthalmoscope showed hyperemia of the discs, at first supposed to indicate beginning neuritis. But this did not progress and was set down as pseudoneuritis. He had slight enlargement of the left lobe of the thyroid and migrain, with tachycardia. The left lobe was removed and his symptoms all disappeared. Four years after he was first seen, vision again became impaired, 20/48, with some concentric contraction of the fields, and at this time the polycythemia was discovered. The blood vessels of the retina appeared quite healthy. There was slight enlargement of the blind spot. The discs were almost as red as the surrounding fundus.

Rheumatism.—Four cases of eye lesions connected with rheumatoid disease are reported by **Junius.** One was an acute iritis, the second an abortive scleritis with iritis in one eye, and chronic iridocyclitis going on to blindness in the other. In a third there was recurring iritis with posterior synechiae in both eyes. In the fourth there was acute iritis with hemorrhage in the anterior chamber, but without synechia. This patient had suffered a former gonorrhea. All of these were cases of chronic "rheumatoid disease," for the treatment of which Junius relies on large doses of salicylates.

Diabetes.—In both diabetes and renal disease, **Garrod** suggests that retinitis is associated, especially with high blood pressure. In diabetes the hemorrhages are apt to be guttate rather than flame-shaped; the white spots are more opaque, sharply circumscribed and more widely scattered in the fundus instead of being massed in the macula. In discussion, Foster Moore stated the chief ocular complications are retinitis, cataracts, retrobulbar neuritis, hemorrhages and retinal lipemia. In some cases the refraction varies with the sugar content, myopia decreasing with the amount of sugar.

Internal Secretions.—In a general review of the influence of the endocrine system and its relation to the eye, **Fridenberg** suggests that the comparatively severe shock produced by ophthalmic injuries and operations is related to the close connection of that organ with the sympathetic and cerebral nervous systems, and that the vascular reactions of the iris and ciliary body are dependent on visceral sympathetic control through internal secretions. He refers to the seasonal incidence of diseases like vernal conjunctivitis and glaucoma as connected with endocrine deficiencies. It may be associated with hyperthyroidism or deficient adrenal secretion connected with emotional states. Endocrine deviations from the normal may account for some congenital defects, may be the basis of family and heredity tendencies.

Fuchs reports a case of photophobia with increased secretion of the ocular and other glands, possibly associated with disease of the hypophysis.

A young man with acromegaly and concentric contraction of the visual field, but little temporal hemianopsia, was shown by **Suker.** The optic discs presented a minimum swelling on the nasal side. The sella turcica was enlarged. **Webster** reports improvement in acromegaly and giantism, and more complete relief of exophthalmic goiter by X-ray treatment. **Roembold** has written on ocular conditions connected with diseases of the stomach.

Arteriosclerosis.—The relations of arteriosclerosis and the eye was the subject of the Middlemore Lecture by **Adams.** Pointing out that this condition results from different pathologic processes, he divides these into three groups: First, simple, high arterial tension without signs of arterial or renal disease. Second, high tension with renal and heart changes. Third, chronic nephritis with secondary tension, sclerosis and heart changes. The first group of patients are largely those who lead the strenuous life; not only work hard, but as Adams points out, play hard, beside hard drinking and smoking. The early recognition of simple increase of blood pressure is important because it is then amenable to treatment. The ophthalmologist sees many patients at the age of presbyopia, and symptoms due to blood pressure may be such as would lead to the suspicion of eye strain.

Adams find that headache on waking in the morning is never caused by the eyes, but should raise a suspicion of high blood pressure. Patients who have their first attack of migrain, about the age of 50, often have high blood pressure. Of eighteen patients between 48 and 67 years of age, regarded as having normal retinal vessels, twelve had blood pressure of 140 to 160 mm., and six a pressure of 170 to 180 mm. He mentions a case with blood pressure of 200 mm., but no alteration of the retinal vessels, relieved of her headaches and greatly benefited in general health from treatment, which reduced the arterial pressure. Among the signs of increased pressure, the one that has impressed him most is the narrowing and light color of the arteries, and the interruption of the light reflex from a vein as it approaches an artery crossing it.

Of arteriosclerosis, with renal and cardiac changes, irregular calibre of the artery is one of the commoner and more important signs. Tortuousity of the arteries is rarer and less valuable. Loss of translucency of the arterial wall is characteristic of severe sclerosis. Among 156 cases showing retinal vascular lesions, forty-eight were followed to the end, and of these twenty-two died of cerebral hemorrhage, or stroke. As to the prognosis of such conditions it is more serious in young subjects and those who have marked renal involvement. The older the patient the better the prognosis as regards life.

In the Japanese the blood pressure averages lower than in Europeans. **Nakamura** states that from 26 to 45 it was 95 mm. Hg., and from 46 to 67 years it was 109 mm. Hg. The average of pressures seen in patients with various ocular diseases was as follows:

Retinal thrombosis	177 mm. Hg.
Retinal embolism	138 mm. Hg.
Retinal hemorrhage	163 mm. Hg.
Conjunctival hemorrhage	109 mm. Hg.
Glaucoma	125 mm. Hg.
Retinal disease with hemorrhage	160 mm. Hg.
Senile cataract	161 mm. Hg.
Chronic retrobulbar neuritis	94 mm. Hg.
Retinitis pigmentosa	134 mm. Hg.
Myopia	121 mm. Hg.

Fox believes that so many cases of arteriosclerosis are seen by the ophthalmologist because of the great vascularity of the eye. He especially notices glaucoma and cataract in addition to the well known retinal complications associated with arteriosclerosis.

Influence of Genital Organs.—The ocular disturbances associated with menstruation and pregnancy are believed by **Blanco** to depend chiefly on disturbances of the nerve centers. Accommodative asthenopia he gives a prominent place and finds it may be relieved by use of ovarian extracts. Muscular asthenopia, from insufficiency of the internal recti, has been found cured when labor was completed.

Skeletal Asymmetry.—In a review of the papers published by Lowman and Mills (see p. 48), **Tubby** quotes some of their cases and discusses the findings. He concludes that two questions are raised; first, is asymmetry of the trunk, legs and other extremities productive of ocular defects; second are the ocular defects one of the expressions of an all prevading asymmetry? May we regard astigmatism as a "corneal scoliosis," and look upon heterophorias as functional disturbances of the ocular muscles? He suggests that this subject might prove good material for team work.

Dental Disease.—A series of cases of ocular lesions, due to dental infections, is reported by **Bell.** One patient had a severe bilateral plastic iritis, and cleared up very rapidly after the extraction of fourteen badly diseased teeth. Another was a case of "rheumatic iritis," cured by treatment of the teeth and gums for pyorrhea. The third had vision impaired by choroiditis and vitreous opacities. Vision was brought up from 20/200 to 20/20 by attention to badly infected teeth. The fourth patient suffered from retinal hemorrhages and a dental infection by streptococcus hemolyticus. He made a full recovery under treatment by vaccines obtained from extracted teeth. Bell advocates attention to the teeth and education of children regarding them in the schools. He believes a dirty mouth is one of the greatest menaces of the human race.

Dewey calls attention to the fact that the relations of the lymph system to affections of the eye from diseased teeth are practically unknown. He points out that the vitally staining cells found in all parts of the body, but larger and more coarsely granular in certain definite regions, are scarce in the iris, especially the anterior layer, but are particularly abundant in the ciliary body.

The importance of careful search for dental foci of infection is emphasized by de **Schweinitz.** The dental area need not be extensive to cause grave ocular lesions. Root abscesses and pulpless teeth are important. As a cause of uveitis, "rheumatism" has been replaced by focal infection, often from dental areas. **Martin** reports another case of the ocular syndrome of contracted visual field and floating opacities in the vitreous, which he believes to be of dental origin. **Brose** reports a case of iritis following a cataract operation, which seemed to be checked by extraction of eight carious teeth. In another case, where cataract extraction revealed opacities, there was marked clearing and improvement of vision in a long period after the removal of six roots. **Evans** has written on the relation of dental to ocular disease, and **Kosterlitz** upon the eye and the teeth. In a general paper on focal infections, **Ravdin** particularly mentions chronic conjunctivitis, scleritis, episcleritis, keratitis, iritis and uveitis.

Nasal and Sinus Disease.—The limitations of the value of the X-ray in deciding if nasal disease exists to account for ocular symptoms, is pointed out by **Potts.** The findings of the oculist are needed to enable the oto-rhinologist to decide whether slight deviations from the normal in the nose should receive more attention than the mere appearances of the parts might demand.

He would classify the ocular disturbances arising from disease of the nose and sinuses as follows: Those due to metastatic infections, arising by continuity, and the trophic and irritative. Metastatic infections become increasingly important with the development of the sinuses; direct continuity accounts for the association of optic nerve disease with that of the sphenoid and posterior ethmoid cells, and also of orbital cellulitis, with disease of the ethmoid, antrum or frontal sinus. The trophic or irritative include blepharitis, photophobia, blepharospasm, minute corneal ulcers and ocular pain. They may arise from pressure of a spur or deviating septum, and an apparently innocent middle turbinate may swell at night or at other times.

The report on the effect of nose and throat infections upon the ocular functions of aviators, published by **Berens** and **Uren,** was based on thirty-eight cases of operative interference in nose and throat infections. They conclude that many pilots, who showed little weakness of convergence as measured by the near point or prism converging power, did show rapid onset of fatigue. The same was true regarding accommodation. They believe this weakness and early fatigue is frequently associated with nose and throat infections. On the other hand it was frequently associated with bad landings.

Stenger connects with disease of the nasal accessory sinuses, acute and chronic ezcematous inflammations of the lids and conjunctiva, phlyctenular corneal ulcer, phlegmon of the orbit, disease of the lacrimal sac and canal, dislocation of the eyeball by mucocele, retrobulbar neuritis, cataract, glaucoma and reflex neuroses. **Tydings** reports paroxysms of pain relieved by straightening the nasal septum and opening posterior ethmoid cells. **Harry** reports ocular proptosis in a child three weeks old associated with anterior ethmoiditis and relieved by curetting and treatment of the ethmoid. **White** insists on early operation in all cases of loss of vision where no other cause can be found, even if the X-ray findings are negative and no definite pathology is discovered upon nasal examination. This should be resorted to after a week of unavailing treatment. After two months little hope of return of vision can be entertained.

A case of retrobulbar neuritis, cured by operation on the ethmoid for nonsuppurative hyperplastic sinusitis, is reported by **Beck** and **Deutsch.** These writers also record a case of neuroparalytic keratitis due to removal of the Gasserian ganglion, which reduced the patient's vision to counting fingers. But vision was restored with the subsequent recovery.

The ocular lesions connected with disease of the neighboring sinuses is the subject of an inaugural dissertation by **Pitschack.** It is based on twenty-four cases seen in the Kiel University Eye Clinic. In the first case reported by **Weidler** and **Joughin,** choked disc with other symptoms of brain tumor were relieved by treatment of ethmoiditis.

Osteomyelitis of Maxilla. — Three cases of his own are reported by **Marx,** who has collected thirty-three from the literature, in which osteomyelitis of the upper jaw in infants has been followed with inflammation of the conjunctiva, exophthalmos and other ocular symptoms.

Goundou.—This disease, also known as "anakhre" and "henpuye," occurs in tropical and semi-tropical countries. It consists essentially of a bony tumor, growing on each side of the nose and usually symmetrical, starting from the maxillary and the nasal bones. It frequently interferes with vision by rising in front of the orbit. It is also said to cause squint, but does not destroy the eyeball. Its etiology is unknown. **Gonzales** reports what he states is the second case observed in Mexico. The patient was a boy of 9, in whom the bony tumors were said to have been congenital.

Diseased Tonsils.—A case of chronic conjunctivitis was cured by **Bell** by having the diseased tonsils removed, after treatment for several years by two competent oculists had failed to give relief. A woman with marked congestive optic neuritis of one eye got well and recovered almost normal vision after removal of the enlarged tonsils. **De Schweinitz** states that the tonsils are more apt to be the site of infection causing ocular disorders, than the dental areas.

In discussing Bell's paper, Woods points out that there may be more than one focal infection back of the ocular disturbance; and that the tonsils are universally recognized as a portal of entry for infection. Yet even they may be removed without benefit. Before their removal there should be exclusion of other causes and the bacteriologic examination of the crypt contents. Veasey reported four cases of ophthalmoplegia interna which recovered in two days to a week after the removal of infected faucial tonsils. King told of a case of episcleritis, multiple arthritis, and other lesions following a virulent tonsilar infection.

Psychoneuroses.—The ocular phenomena in the psychoneuroses of war have been studied by **de Schweinitz,** who finds they do not differ from peace neuroses in their symptoms and evolution, except in their war coloring. They include amblyopia and amaurosis of the kind heretofore recognized as hysteric blindness, with similar contractions of the visual fields, so-called inversion of the color fields and fatigue spiral-fields. There are asthenopias and anomalies of accommodation, such as are frequently observed among hysterics. The anomalies of the iris movements usually had a definite physical basis. Anomalies of lid and extrinsic eye muscle movements seem to be palsies of certain movements, and not of a particular muscle. True nystagmus must have been exceedingly rare, although a species of tremor, which might affect the eyes, was seen. Blepharospasm was common. He observed one case of exophthalmos. **Fraser** has written on hysterical amblyopia.

Cervical Sympathetic Injury. — Eleven cases of war injury to the cervical sympathetic, causing the Bernard-Horner syndrome, were observed and studied by **Scarlett** and **Cobb.** Enophthalmos was the most common symptom, being present in all cases, and all but one showed at least moderate ptosis. Myosis was present in all but one case, but hypotension of the eyeball was found in only five. Sudomotor disturbances were present in about half, while only two patients showed clear vasomotor disturbance. They explain, however, that the patients were only seen four to six months after the injury, and might have recovered from part of their symptoms before coming under observation. Heterochromia was not present in any case, and facial hemiatrophy only in slight degree in one case. Vision was normal, but nearly all the patients showed greater power of accommodation on the affected side. In a few cases the miosis of the affected eye increased when the eyes were turned to that side, and diminished when they were turned in the opposite direction.

Trigeminal Lesions and Neuralgia.—A case of facial hemiatrophy, in which there was also chronic recurrent iridocyclitis, has been reported by **Weekers,** who also refers to the number of cases of neuroparalytic keratitis following influenza. He believes there is a form of iridocyclitis, due to alteration in the nutrition of the eyeball dependent upon the trigeminus. In obscure iridocyclitis anesthesia of the cornea and skin of the forehead should be looked for.

Stevens points out that the close proximity of the sensory nerve fibres of the supraorbital branch, to the unyielding bony structures beneath, make them especially liable to injury by undue pressure; which may arise from abnormal action of the muscles of the forehead, associated with heterophoria. He reports in detail a case of extreme migrain and clavus hystericus, with characteristic habitual facial expression and carriage of the head, in which declination of 2 degrees was found in the right and 5 degrees in the left eye. The correction of the muscular fault gave relief from the headaches and neuralgic attacks attended with mental disturbance, which relief had continued over two years.

Hirsch recommends for the treatment of trigeminal neuralgia injections of acoin, dissolved in a solution of oxycyanide of mercury. These give relief from pain produced by operations or traumatism, or that accompanying iritis or glaucoma.

Migrain, with complications and the equivalents of migrain, is the subject of a paper by **Gonzalez,** who reports illustrative cases. He takes up migrain with tachycardia, with fever and delirium, with attacks of syncope and alternating paralysis, apoplectiform migrain, migrain with aphasia, dysesthesia, heightened memory and imagination, amnesia, hematoma of the orbit; and migrain with predominating ocular symptoms, as pain in the eyeball, ophthalmoplegia, ptosis, enophthalmos, ptosis and vasodilatation, paralysis of accommodation during the attack, impairment of vision, including lateral hemianopsia. He holds that migrain is a neurosis of the cervical sympathetic originating in autointoxication.

Argañaraz believes that headaches in children between 5 and 12 years of age, that persist after defects in refraction and muscle balance have been corrected, may be due to temporary loss of balance between sensory and motor functions, arising from irregular development. He makes a distinction between functional and anatomic balance of the extrinsic ocular muscles. **Dabney** reports a case of headache and other cerebral disturbances, accompanied with retrobulbar neuritis and optic nerve atrophy, in which the autopsy revealed multiple aneurysms of the cerebral arteries. **Weidler** and **Joughin** report cases of severe neurologic disturbance with ocular lesions, including retrobulbar neuritis and atrophy with spinal disease, bitemporal hemianopsia with optic atrophy, and acromegaly with partial blindness.

Ataxia.—In an editorial in the Maine Medical Journal, **Spalding** discusses sensitiveness of the eye to pressure as an early symptom of locomotor ataxia. If this may be relied on as an early symptom it may help to early treatment and arrest of the disease. **Lloyd** reports on the ocular conditions found in two cases of Friedreich's ataxia. The reaction of the pupils to light was sluggish, there was some pigmentation of the fundus in one case, some nystagmus and very slight optic atrophy.

Oculocardic Reflex.—Compression of the eyeball, according to **Binet,** modifies the function of respiration as well as that of the heart. He suggests the reflex can be used in studying heart murmurs coincident with tachycardia, the slowing of the heart action making their characters more distinct. Headache, after trephining, is reduced by compression of the eyeball, stimulating the vasoconstrictors. Such pressure renders respiration slower and more ample, and thus favorably affects asthma and hiccough. It checks the tremor of exophthalmic goiter and athetosis.

Lian and **Cathala** find the reflex exaggerated in patients with bronchitis and asthmatic attacks at night. They suggest, therefore, the treatment of asthma with vagonotocic drugs, especially belladonna. **Guillaume** finds that the oculocardic reflex is valuable in the study of certain psychoses and neuroses. It was observed by **Laval** and **Girou**, in a case of cerebral abscess, following otitis media, that the cerebral pressure caused an inversion of the oculocardiac reflex, which returned to normal when the abscess was drained.

Arsollier suggests that the reflex may be used, besides asthma and hiccough, to regulate the results of thyroid treatment and to suppress tachycardia, and in the persistent vomiting of pregnancy. The pressure should be made slowly progressive, and the pulse carefully watched to ensure that the heart beat does not become too slow, or stop altogether. **Marie** and **Bouttier** find this reflex varies from many causes and that when it has been abolished in epidemic encephalitis its return is not always a favorable sign. **Litvak** finds this reflex active in lethargic encephalitis, and more easily elicited, the more somnolent the patient. In syphilitic meningitis it is always absent, and feeble or absent in tuberculous meningitis. If this is confirmed it becomes a diagnostic point of importance.

Sicard and **Paraf** found that compression of the eyeball inhibited what they call the pilomotor reflex, a production of "goose flesh" in the arm by rubbing or pinching the adjoining intercostal region. **Lagrave** has written on the oculocardiac reflex. **Geneese** has reported on the oculocardic reflex in an infant.

General Papers.—In a paper on the eye in general practice, **Wolf** points out that the general practitioner should understand the share which refractive errors may have in causing vertigo, insomnia, neurasthenia and melancholia, as well as the significance of the Argyll-Robertson pupil. **Patterson** insists upon a more careful study of the ocular fundus for the discovery of intraocular changes that may be the first signs of grave systemic conditions. **Miller** thinks graduates in medicine should be familiar with the prophylaxis of common ocular conditions. **Davis** has written on the causative factors in eye conditions. **Ellett** has written on the ocular manifestations of general disease; **Terson** has pointed out that general and special causes must often cooperate to cause eye disease. He notes the coincidence of erythema with conditions affecting the eyes, as acute glaucoma, which may be regarded as similar to acute edema of the lung. **Pick** has written a general paper on eye diseases following the war, especially scrofulous affections and toxic amblyopias. **Batten** urges a class of ophthalmic physicians, believing the greatest advances in ophthalmology will be on the medical side. **P. Knapp** has published a manual of relation of eye to other diseases.

Ocular Parasites

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This section of the digest carries the literature from September, 1919, to December, 1920. For previous references, see A. J. O., December, 1919, p. 267.

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DIGEST OF THE LITERATURE.

Larvae in the Conjunctiva.—Cases of parasitic eye diseases due to the goni-Mongolian parasite, which are easily acquired from sheep are reported by **Ashikaga.** The shepherds of the Gobi wilderness contract the disease. In one case the cornea was covered by minute white larvae in great numbers which could be detached only with a knife. It appeared from the experiments with the larvae that they were related to Oestridae, inasmuch as these flies lay eggs on the eyelash. The larvae have five to seven tenaculi and eleven air passages communicating with each other. They are 0.85 mm. long and 0.35 mm. broad, covered with cilia on each side. The period of development is very short.

A hundred cases of larvae in the conjunctival sac were studied by **Goldschmidt.** The cases came under his care in the river region of Russian Turkestan, Central Asia. The larvae were seen moving about on the surface of the conjunctiva. They are yellowish-white in color and vary in length from 0.25 to 1.5 mm. The larvae often burrowed into the eyeball, and in some cases rapidly destroyed the eye. Specimens were examined by Kuznetzoff, who classified them as Sarcophila Magnifica Schineri (Wohlfarti).

Referring to Goldschmidt's article, **Fiebiger** adds that these larvae cause severe inflammation or even death from pyemia, and they are very aggressive, even boring into the eyeball. They attack animals, lodging in the eye, nose and vagina. The larvae are 2 mm. long, eleven-ringed, whitish-yellow, with bristle girdles and creeping pads on the last two segments. No distinctive pathologic changes are caused by the larvae in the tissues. He cites cases and confirms Goldschmidt's observations.

Subconjunctival Cysticercus. — Two additional cases of subconjunctival cysticercus are added to the literature by

Gallemaerts. The first case had the appearance of an abscess, which would probably have ruptured with evacuation of the contents and cure, but by operation the contents were obtained and examined microscopically, and showed a complete cysticercus. In the second case the contents of the cyst also showed a cysticercus. Both cases were children, one 5 years and the other 6 years. In the first case the tumor lay on the eyeball, between the superior rectus and the internal rectus. In the other it lay on the ball, between the inferior rectus and the external rectus.

Cysticercus in Vitreous.—A case of cysticercus in the vitreous was reported by **Love.** The patient, a male aged 50, only complained of transitory disturbance of vision. The parasite was estimated to be 12 to 15 mm. by 8 to 12 mm. in length and was best seen with a 16 D. lens. The parasite was provided with a posterior bladder-like sac into which it could draw itself. The head was a rounded snout, with two rows of hook-like tentacles which the parasite protruded and retracted. At times the cysticercus was very active and moved about. The vision in the affected eye varied and at times was 20/20. Three excellent colored plates accompany the article.

A large cysticercus in the vitreous was seen by **de Schweinitz** and **Wiener** in the left eye of a girl 19 years of age. The patient first noted visual disturbance ten months previous to the examination. At the time of examination the vision in the affected eye was nil. A large globular mass from 6 to 7 d. d. in width was noted. A neck-like protrusion with a head at its extremity extended downward from the mass. Hooklets were distinguished on the head. The head was actively motile and often was drawn into the sac. The vitreous was cloudy and an upward and inward detachment of the retina existed. The ova of a tapeworm were found in the patient's stools, but no segments of the worm were discovered.

Von Hippel demonstrated a case of cysticercus of the vitreous. The head was intact. The case was not diagnosed clinically on account of the unusual peripheral position of the parasite, but had been thought to be tuberculosis. A tuberculin injection produced a strong reaction, and treatment for three weeks caused a marked improvement, but suddenly the vitreous was filled with a thick exudate. No evidences of tuberculosis were found in the enucleated eye, but the parasite was discovered to be the cause of the condition. **Oesterreicher** reports on subretinal cysticercus, and **Seimeni** describes a method of determining the position of the cysticercus in the ocular fundus.

Uhthoff reports four cases of subretinal cysticercus in soldiers. In consequence of irregular or suspended meat inspection during the war, observations of cases of cysticercus became more frequent. In his first case vision rose after extraction from counting fingers at 30 cm. to 1.50 m. In the second case perception of light was preserved. The third case was complicated by an adherent thick capsule within a subretinal hemorrhage. Repeated introductions of the loop finally brought out the cysticercus with considerable loss of vitreous. Then incapsulations of long standing have been observed in enucleated eyes, but are rare at such early stages. The attempted treatment with iodide of potassium, neo-salvarsan and benzol was of no avail, in accordance with the experience of Graefe. The visual disturbance, especially at the macula, is supposed to set in at the earliest two months after immigration. This question was important for granting war indemnity in this case. In the fourth case the cysticercus was near the nasal border of the disc. As the eye was without irritation and V = 6/12, operation was postponed.

Elschnig saw several cysticerci in the eyes while examining soldiers. He thinks that the number of cases was increased by war conditions.

Echinococcus.—As a continuation of experiments with the echinococcus (see O. Y. B., Vol. 14, p. 235), **Demaria** injected the parasites into the eyes of dogs, and produced lesions similar to those obtained in rabbits' eyes in his previous investigations.

Filariae.—An article with illustrations of ocular and general lesions produced by the Filaria onchocerca was presented by **Pacheco Luna,** as a continuation of previously published descriptions of the changes which take place when this parasite invades the body. (See O. Y. B., Vol. 14, p. 236, and O. Y. B., Vol. 15, p. 270). The author believes that the ocular changes are excited by toxins which are produced by the organisms and carried to the eye through the blood stream. **Fee** describes an epidemic of Filaria onchocerca as seen in Guatemala.

A filaria loa was seen in the subconjunctival tissue by **James** and **Hunt.** With a suture passed through the conjunctiva, back of the worm, it was held in place until an incision could be made and the worm exposed. It was then grasped with forceps and removed.

A case of filaria loa in the left orbit of a man was recorded by **Holth.** Occasionally the parasite was seen under the conjunctiva.

Tyrrell removed a female filaria loa from the upper eyelid of a man. The parasite was over two inches in length.

Fungi.—In describing the higher fungi in relation to human pathology, **Castellani** classifies mycological affections of the eye as follows: Due to species of genus Nocardia and genus Cohnstreptothrix, ocular nocardiasis; genus Sacchoromyces, cryptococcus, endomyces, ocular blastomycosis; genus Monilia, ocular moniliasis; genus Oidium, ocular Oidiomycosis; genus Aspergillus and Penicillium, ocular aspergillosis and penicilliosis; genus Sporotrichium, ocular Sporotrichosis, and genus Glenospori, ocular Glenosporosis.

In commenting on **McAll's** article, which describes a rare subconjunctival granuloma seen in China, **Henderson** states that he saw similar cases in Shanghai, and suggests the posibility of the condition being due to a parasite.

Hygiene

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This section reviews the literature from December, 1919, to January, 1920. For previous references, see American Journal of Ophthalmology, v. 2, 1919, p. 313.

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DIGEST OF LITERATURE.

Preventive Ophthalmology.—The objects of preventive ophthalmology, according to **Parsons,** are: (1) The prevention of damage to the individual; (a) prevention of damage to the eyes from accidents, deleterious radiations, defective illumination, organisms, etc.; (b) prevention of damage to health from accidents, headaches, fatigue, etc. He calls attention to the loss of time and money by preventable accidents to eyes. Workmen are still loth to wear goggles, which are now generally provided free of charge by employers. Parsons suggests as a means of increasing their use, that the employer be relieved of all liability, if accidents occur when the workman is not wearing his goggles. "Safety-first" propaganda and the efforts of welfare workers are needed to dissipate the suspicion of working people that preventive measures are not solely for their own benefit.

He discusses the deleterious action of ultra-violet radiation on the eyes. Infra-red (heat rays) may also have a potent effect which is important in view of the high temperatures employed in many industries. The amount, quality and distribution of light in schools, libraries, factories, etc., should be carefully regulated; at present such buildings are usually poorly illuminated.

Ophthalmologists should carry out investigations "in estimating the effects of errors of refraction, errors of muscle balance, defective illumination, and so on, on the fatigue of workers in the different processes of various industries."

The examination of the eyes of school children and testing should only be entrusted to qualified men, those who have actual experience in clinics, etc., and to this end Parsons suggests the establishment of ophthalmic centers in various parts of the country.

(2) The prevention of damage to other people. (a) Regulations for the prevention or the transference of contagious diseases; (b) regulations for the public service, navy, army, air forces, mercantile marine, railways, motor industry, movies, etc.

Recently there has been formed the "Council of British Ophthalmologists"—men chosen by the representative ophthalmic organizations of the United Kingdom. This body acts in an advisory capacity to the public services. The council, in operation only a year, has issued a report on the lighting of test types and on the teaching of ophthalmology to medical students and has been asked to appoint representatives to serve on a committee to assist the London County Council in dealing with the lighting of moving picture shows. Among the functions of the council will be fixing standards of vision, color vision, fields of vision, vision under low illumination and ability to judge distances with accuracy.

Parsons states that too little attention has been paid to good printing—its visibility, legibility and eye-saving characteristics. Erdman and Dodge (psychologists), Cohn and Javal have investigated the subject, but the sole practical outcome has been some improvement in school books for young children. The world-famed printers have been guided by canons of art and not by rules of service. We know little about the physiology and psychology of reading and writing, and the sooner we set to work to learn, the better it will be.

In the printing of music the unit of visibility is the accidental sharp, flat or natural. Violinist's notes should be larger because he has to read them twice as far away as the pianist.

In regard to compensation for disability, Parsons states that decisions rendered in the courts result in wide variation in awards for practically identical disabilities. The vast majority of disabilities can be codified on a percentage basis.

For the protection of the eye when the x-rays are used about the lids or orbit, **Wolfflin** places a lead glass shell in the conjunctival sac. After cocainization the prothesis causes no discomfort and does not injure the globe.

Lighting.—A new method of producing "artificial daylight" makes use of a colored (and curiously patterned) reflector, for correcting the distribution of energy in the spectrum of a lamp. The distribution of colors was calculated on spectro-photometric measurements of opaque pigments, made by means of Sir W. Abney's color-patch apparatus. The reflector is designed to produce a daylight effect from a tungsten filament half-watt lamp. The inventor, **Martin**, demonstrated his appliance at a meeting of the Illuminating Engineering Society and showed the difference between the corrected and the uncorrected light in the effect produced upon a number of colored materials. Under ordinary illuminants blue appears low in luminosity compared with red, but with a lamp having the corrected reflector the two colors, blue and red, are not very far removed from one another in luminosity.

The problem of artificial daylight is one of importance in many industries. In the earlier methods transmission through tinted screens was employed. An apparatus, the result of the combined work of a physicist Martin, an artist, Sheringham, and an expert on camouflage problems, Major Klein, and known as the "Sheringham daylight," has recently been perfected. It attempts to solve the problem by the use of carefully combined color reflectors. It is difficult to define daylight on account of its great variability. Commenting on this point, the editor of the Illuminating Engineer for February, 1920, says: "In order that the whole subject may be placed upon a scientific footing, it appears essential that a standard of "normal" daylight should be definite, and the degree of accuracy with which "artificial daylight" units for various purposes should approach this standard specified." He also points out the necessity for a standard white surface and a standard nomenclature of color-tints.

The work reported on by **Luckiesh** was prompted by the recently developed opinion that eye glasses, especially in the industries, should not transmit infra-red radiation. The data presented in this paper do not directly reach the root of the problem, but they are of considerable importance. Energy quantities and densities in the eye media are established and should aid the physiologist who is interested in the question. This paper is confined purely to the physical aspects of spectral energy distribution in illuminants, of the absorption by the eye media; of optical laws, of luminous efficiency of illuminants, etc. The best glass to keep out the short wave chemical rays that induce conjunctivitis, etc., while interfering least with vision is, according to **Larsen**, yellow glass (No. 23 Nitsche and Guenther scale). This absorbs 25 per cent of the 580 $\mu\mu$ wave rays, 50 per cent of the 520 $\mu\mu$ rays and 85 per cent of the 460 $\mu\mu$ rays. The yellow tint is comfortable and impairs vision very little. He adds that the macula is protected with yellow pigment in the retina, another physiologic argument in favor of yellow glass.

There is a prevalent belief that the kerosene flame possesses advantages for the eye not had by other illuminants. A former paper by the authors, **Ferree** and **Rand**, recounted results comparative of the effect of certain filament lamps on the power of the eye to sustain clear and comfortable seeing. In the work of the present paper the comparative testing was continued. Using Welsbach gas mantles of different proportions of ceria and thoria, the results obtained were again compared with those gotten with the kerosene flame.

By changing the proportions of ceria and thoria in the Welsbach mantle, light can be obtained with its dominant color ranging from blue-green, through green, yellowish-green, clear yellow and orange. The maximum candlepower is obtained around 0.75 per cent ceria and 99.25 per cent thoria. The light from this mantle is an unsaturated yellowish-green. With an increase of ceria, the dominant color shifts towards that of the long wave lengths; with a decrease of ceria toward that of the short wave lengths. One table shows the tendency of the different illuminants to cause loss of visual efficiency; another gives a comparison of the tendency of the different illuminants to cause loss of visual efficiency or power to sustain clear seeing and to produce ocular discomfort. The paper is highly technical and cannot be satisfactorily abstracted.

Elworthy writes on the subject of illumination in mines and the importance of the color of the light used. Miners' lamps now made with a yellow globe are preferable to those giving a bluish light from a metallic filament. In a symposium before the Illuminating Engineering Society, Llewellyn, Elworthy, Haldane, Armitage, Fudge, Davis, Pooley and Harman discussed the eyesight of miners. The majority was of the opinion that the faulty illumination of mines should be corrected, especially by the use of better lamps. In one mine reported, the use of such lamps was followed by reduction of nystagmus, fewer accidents and better work. Whitewashing of permanent structures, such as supports, was recommended. However, nystagmus was on the increase in certain mines in spite of these precautions, due probably to the generally increased nervous tension resulting from the war.

In a communication, **Rosenblatt** writes that he can see no anatomic physiologic or psychologic reason for preferring the light to come over the left shoulder when reading. He believes that this universally taught dictum is a misconception as far as reading is concerned, but that it can be applied to right-handed people when writing. Left-handed people should, however, have the light coming over the right shoulder when writing.

Protective Glasses.—In an editorial in the American Journal of Physiological Optics, it is stated that recent investigations have shown that light neutral tints and shades of red and yellow glasses do not markedly influence the absorption of the infra-red, but that glasses which are strongly absorptive in the long wave length region of the visible spectrum are more pronounced and efficient absorbers of infra-red radiation.

Increased temperature decreases the transmission factor in every case except in light blue glass. Data are given by **Coblentz** and **Emerson** to show that of the infra-red rays (heat rays) emitted by a furnace heated to 1,000 degrees or 1,100 degrees C. (1) about 99 per cent is obstructed by "gold plated" glasses, (2) about 95 per cent by sage green or bluish-green glasses, (3) about 60 to 80 per cent by black glasses, and (4) about 60 per cent by greenish-yellow glasses. At higher temperatures these data would be somewhat different.

The committee of the American Medical Association on hygiene of the eye investigated the power of various kinds of glass to absorb injurious radiant energy. **Posey** compiled the report, which included a table of the specimens of glass studied and the results obtained.

The kinds of glass which are most efficient as protection against the ultraviolet rays, when they are of a thickness to be nearly colorless, are Crookes A, Corning 91 B, A. O. Co. Lab. No. 57, A. O. Co. Lab. No. 58, and Noviol O. The last two named are best, but have more color than the others. Of the slightly colored glasses, Noviol A and Noviol A_1 are superior.

A combination of Noviol A and Corning 124A absorbs all ultraviolet and most infra-red rays and has high visible transmission and is efficient for eye protection. A gold film on Noviol is effective but obstructs more visible rays. Smoke, amethyst, blue or purple are poor absorbers of ultraviolet and are little better than clear glass. In ordering protecting glasses, specifications of radiant absorbability, etc., should be given, and lenses meeting these requirements selected under service conditions.

In an editorial **Jackson** refers to the report presented by Posey, and calls attention to its practical value. With the table at hand protecting lenses can be prescribed upon a scientific basis. Provision should be made for accurate testing and classifying of new glasses that might be placed on the market in the future.

Berry speaks of the proposed safety code requiring employés to furnish goggles, and making it a condition of employment that an employé wear such goggles. There are 200,000 eye accidents in the industries every year. Industrial processes in which protection is needed for the head or eyes of workers include chipping, riveting, babbitting, scaling, grinding, sand-blasting, high-temperature welding, open-hearth and blast furnace work, electrical operations and processes involving harmful fumes. One may also note burns from caustics, fragments from mushroomed tools and glass blower's cataract.

Goggles should have non-corrosive frames which will withstand sterilization and must be submitted to a "drop" and "heat" test.

A flexible goggle was made by **Bonnefon** by bending cardboard in the shape of a cone. A piece of tape connected it with two ear pieces. By adjustment of these tapes close contact with the skin through the circumference can be obtained and protection or compressive occlusion of the eye accomplished.

Type.—In his presidential address before the American Medical Association, April, 1920, **Surgeon General Braisted** discussed "Causes of Eye Strain in Children." He notes that a large proportion of the text of school books is in fine print; much is set up in 6-point type. No child of 10 or under should have to study a book printed in anything smaller than 12-point lower case, or 8-point capitals; and older children should not have to con by the hour a type finer than 10 point. If fine print could be officially stigmatized as a menace to eyesight; if the federal government were to forbid the transmission through the mails of children's school books improperly printed, we would have a ready solution of the problem. Left to the example of the individual school or to the individual state, the correction of an evil of this kind will not be achieved for many, many years.

The strike of printers in 1919 compelled many magazines to suspend publication. Others, more resourceful, issued numbers printed directly from photo-tint plates from typewritten copy. **Würdemann** noted in this copy a lessened legibility, largely due to the difficulty of instantaneous recognition of the word symbols made up of letters. The easiest face of type to read is one in which the vertical lines are more accentuated than the horizontals; in ordinary type of the typewriter the horizontal components are of about the same weight as the verticals. When magnified the typewritten copy will be seen not to have the clear definition of the lead-type print. If, however, clear copy of type to which we are accustomed be thus reproduced, a satisfactory, easily read page may be made.

Myopia and Education.—A very interesting discussion of myopia and its relation to education took place at the 1919 meeting of the Ophthalmological Society of the United Kingdom. **Harman** discussed children whose eyes are immature, defective or blind.

1. Immature: Strain, illness or a toxic condition interferes with the functions of the eyes. In early years the instability of accommodation and binocular vision is notorious, and this instability must extend to other functions of the eyes and to the fabric of the eye itself. In a young child "the eyes feel fatigue in proportion to the mental exertion needed to recognize the meaning of the object presented to the eye."

Set lessons in the infant's class are commendably brief, in comparison to the time allotted to action, lessons or games. The allotment of time has been made with a view to the supposed needs of the average child. A child taken into the school at 4 (earlier than in the United) does not have his ocular examination until 7. This is surely a most unscientific procedure. One might almost stigmatize it as inconceivable.

Harman examined under hemotropin 368 young children's eyes (in breeding and nurture above the average). These were divided into:

Group I, or Average Eyes: Emmetropes, H. less than 2 D. As. less than .5 D. + H. less than 2 D. Total 236 = 65.1 per cent.

Group II, or Imperfect Eyes: H. over 2 D. As. more than .5 D. H. more than 2 D. with As. Myopes. Cataract cases. Total 126 = 34.9 per cent.

"This means that one in every three children is not fit to do ordinary school work under ordinary conditions." He concludes that our present methods of submitting infants to the work of school life without any attempt to ascertain their fitness for the work is wholly unscientific. He would grade young children according to sight as follows:

Grade I. Fit for the regular curriculum.

Grade II. For "easy treatment" as regards eye work and extended observation.

Grade III. For glasses and "easy treatment," i. e., using educational methods similar to methods employed for the semi-sighted.

2. Defective. In 1907 the first "myope" classes were started. There are now twenty-one in London alone. The children in these classes show congenital defects in 7.02 per cent, damaged eyes from inflammation in 30.35 per cent and myopia in 62.62 per cent.

The scheme of teaching is as follows: 1. Oral teaching with normal children. 2. Writing on blackboards with chalk, free-arm fashion. "Printing" of books on large paper sheets, using rubber-faced types. 3. Handicraft that will develop attention, method and skill with the minimum use of the eyes or of muscular strain. Instruction in the proper use of the eyes so as to cultivate a habit; 6/18 or 6/24 with correction is needed. Those with 6/36 to 6/60 are better placed in the blind school.

3. The blind need the cultivation of the social sense, which they can best secure by free intercourse with the mass of the people. For this reason Harman is opposed to residential schools for the blind. In London there are ten centers for the blind. To these schools the children travel daily. They live at home with their parents and normal kindred and play with normal children. At 13 they go for four years to two residential schools where they learn a trade.

This is the ideal; it is a happy mean between educating the blind wholly with normal children and wholly in residential schools. Blind children above 14 are of all grades of capacity. At present they receive their trade training all in the school. The better children are delayed in their progress by the presence of those of poorer powers, and the latter are injured by the strain of the hopeless attempt to keep pace with their betters.

Of the school children of London, **Langmead** states that 20 per cent of the boys and 22 per cent of the girls had defective vision. Refractive errors should be corrected, and a system of education should be instituted which would demand as little as possible use of the eyes.

Butler protests against debarring myopes of 2 or 3 D. from secondary schools, and asks what right have oculists to say to the low myope that he shall not receive the best education obtainable. Butler doubts whether near work increases the degree of myopia. In his opinion the abolition of Gothic characters has had nothing to do with the diminution of myopia. Very high myopes with choroidal changes are more frequently found among the rural than the urban population. He points to the occurrence of high myopia (10 to 11 D.) in children and 2 and 3 years old who have never looked at a book. He thinks that "until this matter of the causation of myopia has been put upon a scientific footing there is no justification for governing a policy by it." If accommodation produces a rise of tension (as claimed by some on the basis of manometric experiments) this is a "benign" rise.

Sym commends the progress that has

been made in examining children's eyes in schools, but states that the work is not yet perfectly accomplished. Children are kept at tasks unsuited for them, and others are forced to wear spectacles who would be better off without them. Education and civilization tend to increase the frequency of convergent strabismus and myopia. In the days of our ancestors the myopic type could have no chance of perpetuation, whereas now it has. In a "state of nature" there is no myopia. Civilization does not produce myopia, but it suffers the myope to live and thrive. Most high myopia—15 to 25 D.—is not the result of school work, and is more often found in laborers and rustics than among the literate.

Sym divides myopia into three classes, as follows: (1) Physiological: Fundus normal, no myopic crescent, vision full. In this class lenses are needless! (2) Pathological: Vision 6/24 or less, staphyloma with wavering margin, choroidal degeneration, "speckling" about macula. Such a child will run up to 25 D. with vision reduced to counting fingers at 10 feet. For such a case there is no means of prevention. (3) Tending to become pathological: Myopia up to 3 D.; vision 6/12 to 6/9, narrow, ill-defined crescent. He advocates mild outdoor exercise such as golf or croquet. Full correction should be worn constantly. Sym is not inclined to correct indiscriminately hyperopia or astigmatism in children, as low hypermetropia is apt to diminish with the growth of the eye, and there is also a change in the corneal curve tending to lessen or abolish astigmatism with the rule.

Clarke thinks the unilateral highly myopic eye is "abnormal" and should not be classed in any sense with ordinary errors of refraction. Bad lighting often manufactures myopia. He has seen schools where the pupils had to face the light, so held their books close to the eyes and stooped over. A child of myopic parentage under 6 must not be taught to write; such a child should chalk on blackboard or slate at arm's length. He may also be given wooden blocks bearing the alphabet and numerals. By this "nursery" ophthalmic hygiene he hopes to prevent the onset of myopia.

Children should not sleep facing a window. Better methods of teaching, lectures and diagrams, would obviate prolonged perusal of texts, and hence much unnecessary accommodative effort. "While the eye is soft there should be more actual personal teaching and less near work and preparation from books."

Whitehead points out that training with blackboards cannot be continued indefinitely. What is the proper time for myopic children to resume work in ordinary classes and begin to use ordinary books? He objects to block-playing, as stooping over them on the floor induces myopia. In many cases, myopia will cease to increase; such patients may resume work in ordinary schools. Many myopes will grow progressively worse despite all care. "The routine in a myope school would do much to arrest the defect, and if it could be arrested up to the age of 10 or 11, the child could safely be left to go to ordinary schools."

In discussion, Pollock says that every child's eyes ought to be examined at least once. "Merely testing the visual acuity would not enable one to know which were the bad eyes; they must be seen and examined by one who had been especially trained in eye work." In three myope classes during the past eight years he had kept every myopic child under atropin, sometimes for three years. It was among these cases that he saw a certain diminution of myopia occurring.

Evans protested against the policy of putting myopes into the class of chronic invalids. Sudden increases in the degree of myopia come on, not after close work, but during critical periods of development or after illness, thus suggesting that the cause is constitutional.

Stack advocates early examination to catch early visual defects. **Hay** advocates a standard of blackboard illumination in schools. In smoky cities artificial light is needed throughout many winter days. The blackboard should be washed, to insure adequate contrast with the chalk.

In criticism of a "leader" in a former issue of the British Medical Journal, **Harman** states that school myopia "is a term of currency," implying a low degree of myopia, up to 3 or 4 dioptres. There are many conditions that go to the production of myopia, whether of low or high degree—heredity, congenital defect, illness, bad social conditions and too much close eyework. He takes issue with the writer of the "leader," who denies the influence of the last.

"School myopes" (as defined above) are not admitted to the myope classes which are reserved for children who are short-sighted to a serious degree, whether by reason of high myopia, scarred eyes or congenital defect. These children are not fitted to join in the normal curriculum, and the "myope" classes were established to fulfill the need of these seriously handicapped children."

Meade states that in progressive myopia of school children, a temporary cessation of near work coupled with Swedish drill exercise, brings about improvement. On resuming near work the improvement is lost and there is a tendency for the myopia to progress. This leads to the view that near work at least aggravates the condition. As varicose veins and pulmonary tuberculosis are not congenital, there being in some individuals merely a "hereditary predisposition" to these troubles, environment and subsequent life history being the exciting factors, so with myopia.

While many cases of myopia are congenital, **McDonnell** believes that uncorrected hyperopic astigmatism may be converted into mixed astigmatism and myopia, if uncorrected in children.

Hathaway's manual for conservation of vision classes deals with the segregation of the child with poor sight in special classes at the public schools.

Ocular Hygiene.—An examination under cycloplegia of every child's eyes is strongly urged by **Morgan,** who points out that a child may have 20/20 vision and yet have a latent hyperopia up to 4 D. Pain, nervous disturbances and convergent squint may appear if the refraction is uncorrected. Then, too, myopia may be prevented by early correction of astigmatism. Another advantage of cycloplegic examination would be the early detection of intraocular disease.

Lockhart gives certain rules of ocular hygiene which may be epitomized as follows: (1) work by a north light which falls over the left shoulder; (2) electric lights of high candlepower hung in the ceiling and protected by frosted globes are the best artificial illuminants; (3) most people need glasses "to relieve their ocular muscles and visual brain centers of the constant and painful effort necessary to overcome the slight optical inequalities in the shape of their eyes," and not for the purpose of improving distant vision; (4) do not buy cheap tinted glasses; (5) eyes should be rested when suffering from sinusitis; (6) avoid overeating, too free indulgence in alcohol and tobacco; (7) cataract is to be avoided by general and ocular hygiene.

It is **Gowen's** opinion that the attention of the general practitioner should be called to the importance of the recognition and correction of eye defects in the adult.

Ophthalmology and Child Hygiene.—Ophthalmological conditions which have a direct effect on the health and development of children are divided by **Newcomb** into the following general groups: (a) congenital defects and hereditary constitutional diseases; (b) prenatal and postnatal traumatisms and infections; (c) communicable ocular diseases; (d) ocular disease arising from malnutrition and arrested development; (e) errors of refraction and anomalies of the extra-ocular muscles.

The trachoma-infected child and all suspicious cases should be debarred from school. The assumption that the eye is normal because visual acuity is high is unjustifiable. Many children with high hyperopia have good vision and may have no symptoms directly referable to the eyes or head. The nervous system in a very high percentage of cases presents the initial symptoms of ocular strain. The more frequent nervous manifestations are nervous excitability, irritability, restlessness when asleep, dreams of an unpleasant nature, contortions of the muscles of the face or eyelids, and as a direct result of the state of turbulence of the entire nervous system, faulty deportment in school and at home. General improvement following correction of errors of refraction is marked with proper functioning of various organs which have no direct connection with the eyes.

Conservation of Vision.—Two new pamphlets will shortly be added to the popular series on Conservation of Vision issued by the Committee on Conservation of Vision of the American Medical Association—one on crossed eyes and one on cataract. The chairman of the committee and the secretary of the council have held several conferences with a committee from the American Optical Association with a view to the inauguration of a campaign for the education of the public on conservation of vision, and the detection and correction of errors of vision, especially among school children and industrial employés. This plan will be directed by a committee on which the council and its sub-committees will be represented.

Referring to a former article on industrial conservation of vision (Y. B., 1914, p. 447), **Shanklin** reports that since it was published there has been a very favorable change in the attitude of the manufacturer toward this subject. Since organization of safety departments the number of eye accidents in industries has fallen from 6.5 per cent to 1.6 per cent. The wearing of protection goggles and the early consultation of an oculist, rather than the shop handy man, are the most important factors in this reduction. The author makes a plea for more active cooperation between the oculist and the safety department of industries.

Thomas discusses the inadequateness of sight for modern demands. The paper is rather discursive and touches on many topics not closely connected with the subject. **Hogue** and **Tindall** write on conservation of vision, and **Wescott** on the care of the eyes.

Prevention of Blindness.—An editorial in the Boston Medical and Surgical Journal comments on the service of the National Committee for the Prevention of Blindness. In five years the committee has grown from sixty-five charter members to 2,280 members and donors. It has sponsored and secured the enactment of laws for the conservation of vision in eighteen states.

There has been a notable reduction in the number blinded from preventable disease. In 44 schools and day classes for the blind, 105 of 622 new admissions were due to blindness from ophthalmia neonatorum. The percentage for this disease is 16.9, an increase over last year's report of 2.2 per cent, but a marked decrease over five years ago. Blindness due to wood alcohol has increased greatly. Trachoma is under better control. Eye accidents are fewer.

Follow-up work by special social service nurses in cases of eye trouble has proved to be of considerable value, inasmuch as many people, through ignorance or carelessness, neglect instructions or fail to keep in touch regularly with hospital clinics, and suffer in consequence, deterioration or destruction of vision. By means of stories, talks, slides and moving pictures, the young people are being brought to a realization of what good vision means. To conserve the vision of the rising generation, every child's eyes should be examined by an eye specialist on entering school and once a year thereafter.

A report of the regulations and principles of the Mexican Society for the Prevention of Blindness was reported in the latter part of 1919.

An editorial in the Journal Missouri State Medical Association states that trachoma is increasing in Missouri and is a very real danger. **Woodruff** discusses the creation of the Missouri Commission for the Blind, pensioning the helpless blind, ophthalmia neonatorum, etc.

Harris notes the sudden increase in blindness from wood alcohol, and agrees with **Berry**, who urges special legislation to prosecute and punish those who substitute this poison for alcoholic stimulants. Educational work is best carried on by lectures and press articles. Recently a staff of oculists has been appointed by the Missouri Commission for the Blind.

Prevention of Epidemics.—A systematic review of the work for prevention and treatment of trachoma and the military orders relative to the induction or rejection of registrants with trachoma is given by **Black.** He also reviews the management of the trachomatous in Chinese and Egyptian labor companies abroad. **Dimitry** shows that trachoma is a problem in Louisiana, and pleads that all cases should be reported, as provided for, but not done.

Influence of Climate on Ocular Disease.—It is stated by **Santos-Fernandez** that a warm climate tends to diminish the number and seriousness of many ocular troubles, as hygienic rules can usually be followed with more ease. In the public schools the illumination of the class rooms does not need to be increased; on the contrary, it is necessary to devise means to reduce the glare from the brilliant sunlight. Retinal hyperesthesia and consequent asthenopia is common, due to the bright sunlight, especially among workers at the sea shore, sponge fishers and fishermen.

Ophthalmic Sociology

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This section carries the literature from October, 1919, to December, 1920. For previous references, see vol. 2, December, 1919, p. 321.

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DIGEST OF THE LITERATURE.

Professional Relations.—The lack of understanding of ocular hygiene by the laity leads **Wescott** to ask what more can the profession do as a body to bring it before the public? Aside from instruction of nurses, teachers and other special groups he would discuss with young patients the choice of an occupation, and with older people the importance of regular examinations, to secure visual efficiency and recognize dangers to general health. He finds the examination of school children by teachers and school nurses has never been effectively done in Chicago. **Bulson** reports on the work of the Knapp Testimonial Fund.

The Council of British Ophthalmologists, which was organized May, 2, 1918, has issued four reports: I, Standard Illumination of Tests of Visual Acuity; II, The Need for Improved Training of Medical Students in Ophthalmology; III, The Need for Higher Qualifications in Ophthalmology; IV, Vision of Men Engaged in Motor Transport. Other work along ophthalmologic lines is being undertaken.

Würdemann attacks the commission evil as it relates to ophthalmologists, in whatever form it appears and however disguised. **Burleson** refers to unethical relations between oculists and opticians, and states that many oculists in Texas refused to fight the proposed optometry law because of the low medical standards of many professed oculists. **Clark** pleads for better co-operation between the general practitioner and the specialist, urging earlier referring of cases which the former cannot handle properly. He also urges better co-operation between the oculist and the dentist. **Brown** tells of the agreement between the Department of Public Welfare and the University of Illinois to erect and conduct a modern central group hospital. By this means a better study of eye conditions and care of patients can be accomplished.

Opticians and Optometrists.—In reporting for a commission on the registration of sight-testing opticians in Australia, **Kenny** says that sight testing may never be abandoned by opticians. It will be necessary for ophthalmologists to equip themselves to do refraction work more thoroughly and accurately than the most skilled optometrists. The public will soon recognize the higher class of work and seek it in so far as they find it obtainable. **O'Brien** has also written on the registration of opticians in Australia.

The Kentucky Medical Journal states that the new medical practice law directs the State Board of Health to select three out of seven certified members of the Kentucky Association of Optometrists to examine applicants to practice optometry, and the grades made by the applicants must be accepted by the board and considered in conjunction with their grades in anatomy, physiology and pathology. Successful applicants must limit their work to optometry. All optometrists, however, engaged in practice before January 1, 1920, may receive a certificate without examination. The law does not prevent the sale of glasses in mercantile establishments.

In Spain there is a movement on foot to enact laws which would limit the activities of opticians. **Gonzalez** discounts the efficacy of such laws. The author believes that the evil can be overcome by a carefully conducted educational campaign, which would emphasize the fact that disturbance of vision is due to an ocular defect, which often has as its basis some general pathologic condition which would not be recognized by any other than a person with a medical training.

Onfray for the Commission on Spectacles of the Société d'Ophtalmologie de Paris reported recommendations for the numbering of prisms according to the angle of deviation; for the use of the notation of the Congress of Naples on the apparatus, trial lenses and prescriptions for cylindric lenses; for the use of round or rounded oval lenses, numbered in millimeters; and for the use of concavo-convex surfaces for periscopic effect. Oculists should make their own frame measurements instead of leaving this to the optician.

Würdemann refers to an article in the daily press in which it is claimed that every part of the body is represented in a definite area of the iris, and holds it up as an example of nonsensical newspaper medicine.

War Ophthalmology.—An outline of the history of the recognition of the specialties in the army and the organizaton and work of the Division of Surgery of the Head has been published by **Parker**. According to **Würdemann**, the proportion of surgical to other forms of ophthalmic work was less than the proportion of surgery in other branches of the service. The surgeon had first to be a diagnostician for the elimination of the unfit, then a refractionist, a consultant with other branches of the service, a sanitary inspector and a statistician. **Young** refers to the difficulties under which the ophthalmic members of the Medical Examining Boards labored, in deficiency of equipment and large numbers of men to be examined. Under such circumstances, the best that could be done was to weed out the plainly defective and to pass doubtful cases up to the Army Boards.

Wilder mentions the ocular requirements at the beginning of the war, and describes the changes made. These were in the direction of discriminating between incapacitating and nonincapacitating defects, with a tendency to limit the restrictions for special service. **Duane** discusses the question of the visual qualities required for signalling at sea, and the pathologic effects of visual strain. He describes the various types of signals used. Vision should be 20/20–20/15, with no high degree of ametropia. Keen color sense and acute light sense with ready adaptation are essential. Motor anomalies, at least of low degrees, are unimportant. The signal man must be alert but not erratic. **Santa Cecilia** has written on acuteness of vision in military service.

Bowdler examined the records of 4,319 aviation candidates. Vision was 6/18 or better. Comparison of groups of pilots of long experience and distinction with accepted candidates showed a diminution of frequency of visual defects amounting to 4 per cent of the total in the former.

Greenwood gives a brief résumé of the activities of the members of the American Academy of Ophthalmology and Oto-Laryngology, with a roll of all members in active service, their ranks and various stations at home and abroad. Some of the highest positions attainable by volunteers were held by members of the society, including subcommittees on ophthalmology and otolaryngology, head of the ophthalmic reconstruction work, commanding officers of base hospitals, regional consultants, instructors in training schools, etc. **Greenwood** also describes the organization and activities of the ophthalmic service in the American Expeditionary Force. He mentions the conditions of the various base hospitals about May, 1918, and the steps taken to improve the service, such as the appointment of consultants and circulars concerning treatment, glasses, artificial eyes and trachoma. He describes the optical department, care of the blind, use of magnets, reports from ophthalmic surgeons and trachoma survey, the army of occupation, organization and improvement of the ophthalmic service. He concludes with a list of ophthalmologists in the American Expeditionary Force on December 1, 1918, with their ranks and stations. **Fenton** describes the Ophthalmic Service in the American Army of Occupation, with its personnel. There were eleven ophthalmic services, some of which were later replaced by others.

Danis gives a description of the Ophthalmologic Service of the Belgian army in the field. Cylinders and combined lenses in the usual combinations were made up, the correct axis being obtained by using a frame with round cells. This permitted the turning of the lens into any desired position. He gives a list of the diseases found in the Fifth Army Division.

McPherson reports the ophthalmologic work done in the Mesopotamian Expeditionary Force during 1917–1918. Ophthalmologic centers were located at Bura Amara and at Bagdad. There was a total of 19,661 cases, 638 operations, 7,884 trachoma cases, of which only 39 were British, the rest being among the natives, 255 cases of ophthalmia artificially produced in order to obtain discharge from the army, 425 cases of night blindness, chiefly Indians. Malingering, so far as vision was concerned, was comparatively rare. There were two cases of glaucoma, age 27 and 29, and two cases of quinin amblyopia in patients with idiosyncrasy.

Ramsay and **McIlroy** tell of the work of the Ophthalmic Department of the Third Scottish General Hospital at Glasgow, 1915–1919. They give the statistics of refraction, injuries and diseases. The injuries are discussed under three heads: (a) to one or both eyes; (b) loss of an eye; (c) with hemianopsia. Cases are reported, among others, of gas poisoning with shell shock amblyopia, amblyopia due to traumatic neuroses and sympathetic disease. Of the latter, there was only 0.3 per cent of the total number of indoor patients (992).

Wallace reports his statistics of four military hospitals in England, both as to the number of patients, the number of different diseases and other ophthalmic work that was done in connection with them. Altogether he deals with 19,125 records of cases.

Out of 342 cases of partial or complete blindness due to the war, which were seen by **Chapusot**, 40 per cent were due to injuries of the eyeball, 33 per cent to injuries of the orbit, 17 per cent to injuries from grenades, 9 per cent to disease and 1 per cent to either thermal or chemical burns. **Hanna** classifies the varieties of ocular lesions found in 237 cases of eye disease in the Ulster division.

In comparing the American and German systems of supplying spectacles to soldiers, **Fenton** recommends that we adopt their system of supplying each soldier who has a high degree of error with two pairs of spectacles, and that a copy of his prescription be entered in his pay book to avoid the necessity of re-examination and thereby lower the number of noneffectives. Means of more rapid replacement of broken lenses to this class of soldiers should be insisted upon, and delivery made by courier and not by mail. The use of meniscus or toric lenses instead of flat lenses, to reduce distortion through the periphery of the glass, and provision for glasses to be used with gas masks should also be made. **Casolino** has written on the eye department of a field hospital, and **Feilchenfeld** on eye diseases in war time.

Vision for Aviators.—A symposium on the visual requirements of aviators was read before the Ophthalmological Society of the United Kingdom. **Spearman** discussed stereopsis and the methods for testing the same. The testing apparatus should be constructed so that the changes can be made as rapidly as possible in an endeavor to simulate actual flying conditions. Spearman advises that some instrument or mark be placed on the aeroplane in a convenient direction and at an absolutely known distance from the pilot so that the full benefit of stereoscopic perception of relative distance could be judged and compared with approaching objects.

Brailey, who had a long experience with aviation, is of the opinion that slight defects of vision, which could be corrected with lenses, or errors in muscle balance are not necessarily a handicap to flying, and he calls attention to the fact that the percentage of accidents among aviators who wore glasses was no higher than among those who had perfect vision. He thinks that the paralactic sense is of greatest importance in making successful landings and that the stereoscopic sense is of little value, as successful landings were made by men who had only one eye and by those with an amblyopic eye. The most essential requirement is an accurate and rapid co-ordination between the eye, the brain and the muscles. In time of stress, where complete medical examination and observation cannot be carried out, the "ground man," who has an opportunity of observing the judgment, daring and courage possessed by the candidate, is qualified to select fliers just as a coach selects personnel for athletic teams.

Clements does not entirely agree with Brailey and states that men who had been flying, though they had only one eye, had learned quasi-stereoscopic vision long before, and the majority of failures were among men who would have to wear glasses. The Bishop Harman diaphragm and Spearman's test are practical for testing candidates. Clements emphasizes the importance of the peripheral fields of vision in maintaining balance. If the flier can see the planes he can maintain balance. The relation of the nose of the machine to the horizon is also a guide in flying level.

Flack emphasizes the importance of testing endurance of flyers at various altitudes and believes that the ophthalmologist should test the vision and ocular muscles under such conditions. The discussion was continued by **Parsons, Greene, Butler, Eaton, Cruise** and **Clark.**

The extremely interesting paper of **Wilmer** reflects the development of our conceptions of the ocular functions of the aviator. He reviews the types of fliers, general considerations of factors bearing on their work, their sight, the case of the one-eyed man, color vision, muscle balance, stereopsis and retinal sensibility. His conclusions are:

1—Absolute normality of the eyes is one of the greatest physical assets that a flier can possess.

2—Affections of only passing inconvenience on the ground are serious in the air, such as scintillating scotoma, muscae volitantes, photophobia, epiphora, heterophoria, and for the night flier, poor dark adaptation.

3—A successful combat pilot with trained air vision who loses one eye may, during the exigency of war, be seriously considered for a return to flying status, under certain conditions previously mentioned. This, however, should be considered only when the confidence is unimpaired and there is keenness to get back.

4—In classification a cycloplegic should be used, and the fields for form and color taken and recorded.

5—The regular eye re-examination

of the flying officer should be made every two months.

6—The simple visual reaction time is of great value to the chasse pilot, if associated with cool determination and caution.

The visual fields of forty flying officers were taken by **Doesschate.** Defects were found in eighteen. The scotomata were mainly of the ring type; in only one was the ring complete. Doesschate found the ring 25° from the fixation point in some of his cases. The author considers these cases are similar to eclipse blinding and due to the more highly refractile rays of light. **Birley** has written on the application of medical science to aviation.

Vision in Public Services.—The British Air Ministry issued a pamphlet entitled The Medical Examination of Civilian Pilots, Navigators and Engineers. The section on eye examinations contains directions for employment of tests for vision, color vision, heterophoria, convergence, power and fields of vision, and emphasizes that doubtful cases should be sent to the specialist. The standard of visual acuity required is 6/6 with each eye, but in certain suitable cases the standard may be relaxed for civilian aviators to 6/9 and 6/12, correctable, to 6/6 with glasses. Normal color vision is essential.

To add evidence that the one-eyed motor driver is a source of danger, **Mayou** reported an instance in which a man who had lost his right eye collided with another vehicle while driving his motorcycle. The accident was due to misjudging distance on the right side. **Erb** has written on testing vision for railway service, and **Gilbert** on requirements for visual acuity of railway employés.

Vision of Drivers on Public Roads.—The Council of British Ophthalmologists has made a report recommending the following requirements for licenses to drive mechanically propelled vehicles on the public roads. After a review of regulations existing in other countries and of the number of accidents reported in various kinds of vehicles, they urge that no person who from any cause has double vision should be granted the license to drive. They suggest three kinds of certificates: (A) certifying visual capacity to drive any kind of motor vehicle; (B) any kind of vehicle other than a motor omnibus or tram car; (C) ability to drive a motor tram car. For (A) the applicant should show himself capable of driving in a dim light. His examination by an ophthalmic surgeon should show visual acuity of 6/9 in one eye and 6/24 in the other eye without the aid of glasses. A full field of vision in each eye. No manifest squint. No double vision.

For (B) every applicant, in addition to manifesting his ability to steer a motor car satisfactorily in daylight, and in an examination by an ophthalmic surgeon should show visual acuity of 6/9 in one eye and 6/24 in the other eye with glasses if necessary. A full field of vision in each eye. No double vision.

For (C) every applicant should be required to show himself capable of driving a motor tramcar by day and by night. He should reach the same visual standards as for a Grade A certificate.

War Blind.—The psychic condition of the war blind constitutes an extremely important factor in their rehabilitation. **Wholey** discusses it on the basis of his experience at Hospital No. 7, "Evergreen," where he studied 115 cases. Of these, 42 were concussion cases, the loss of the eyes in all but 5 being due to high explosives. In a few there was evidence of damage to the central nervous system, leading to progressive deterioration. But of all the cases only 2 presented symptoms of major hysteria, and neither of these men had been injured in battle, and both had shown symptoms of hysteria before becoming blind. He believes that with the instant blunting of consciousness, shown by absence of pain, simultaneous with the blinding, it was impossible for the mechanisms necessary for the acute onset of hysteria to come into play.

The attitude of the blinded man toward the study of Braille has diagnostic value, although in some cases inopportune, early urging to study it, seemed responsible for an extreme dislike and inability to take it up. Wholey observed no type of mental reaction that may be regarded as peculiar to the blind. A great factor in sustaining their morale and attitude of cheerfulness was in being associated with those similarly afflicted in a big common experience. Men placed apart from other blinded soldiers had been lonely, unhappy and unable to adjust themselves to their handicap. It happened almost uniformly that the men were eager to return to the life at the hospital after they had been home on furlough. The discipline of military life also seemed of great value.

Foreman stated in Parliament that there were 1,300 blind soldiers receiving pensions, and 110 had been refused because the blindness was not the result of military service. All are sent to St. Dunstan and trained in new occupations.

Martel has written on the war blind. **Patton** thinks that as oculists we should familiarize ourselves with the various institutions and methods for teaching the adult blind, in order to give our blinded soldiers the best vocational social reconstruction. **De Schweinitz** has written of his observations in France, England and in America at Evergreen, on the work of making the blind useful, satisfactory, bread-winning members of the community. **McMurtrie** and **Gourvich** have published an abstract catalog of literature on the war blinded.

Provision for the Blind.—Now that the war is over, **Redslob** wishes to stimulate the interest of the ophthalmologist in schools for amblyopic children. The excellent results obtained in such a school at Strasbourg are cited. The essayist emphasizes the necessity of having small classes, not to exceed thirty such pupils in number. The instructor should be familiar with the needs of such pupils and specially trained for this branch of teaching. The eyes should be saved as much as possible and instruction given, when practical, through the other special senses.

Grasemann, Cohn and **Steinberg** discuss touch reading of raised type by the blind. All agree that the left hand is most sensitive and is used for reading by three-fourths of the blind. The left index finger is most often the reading finger. Reading by touch takes from three to four times longer than reading by sight. An apparatus to assist the reading of the blind has been described by **Guenther** and also by **Machts.**

Cantor writes on the care and education of the blind paying special attention to the origin of printing for the blind. He gives a full description of the Braille system of reading and the shorthand machine. Through **Harper** the New York State Commission for the Blind hopes to organize a local committee in all sections of the state where a census proves the need to exist. The commission would like to send to each blind person a home teacher who is also blind.

Peirson-Webber writes from the standpoint of a man who is blind, and advises lectures to seeing people on practical sympathy. They should be taught especially to avoid anything that will tend to make the blind morbid, supersensitive or irritable. Exercise, especially with a seeing friend, conversation of a cheerful type, practical friendship and work as soon as he has acquired the ability—these are the things recommended for the blind man. There should be various kinds of amusements, such as sailing, rowing, dancing and fishing, to alternate with work. The signature of the blind is the subject of a paper by **Bouquet.**

The subject of blind masseurs has received considerable attention in the English journals. The Lancet, referring to the licensing of the Association of Certificated Blind Masseurs by the Board of Trade, states that a blind masseur is not as good as a sighted one, owing to his limitations. **Magill** details the conditions in which the blind masseur is inferior, and **Keen** and **Westmann** likewise believe that there are limitations to the value of his services. **Broad** takes exception to these statements, and claims that a properly trained blind masseur is in no way inferior to a seeing one, which position is supported by **Pearson** and **Bliss. Waterson** has written on the attitude of the government to the delegation of the blind.

Addison presented to Parliament a

bill providing for the giving of a state pension of 10 shillings per week to all blind persons between the ages of 50 and 70 who were unable to work. Replying to **Astor,** he states that blind members were to be admitted to the Advisory Board Committee until at least one-third of the committee were blind people. The British Medical Journal states that the minister of health proposed to Parliament a grant for the following purposes: Workshops for the blind, home workers, homes and hotels for the blind, home teaching, book production, work of county associations and miscellaneous. In regard to the latter, the minister requested research work in new industries for the blind, or in connection with the prevention of blindness.

Discussing this bill, Tillett said that there were 30,000 dependent blind, of whom 10,000 were supported by the poor laws, 7,000 more or less industrially employed and 2,000 industrially employed with an efficiency of 35 to 50 per cent. Addison claimed that people above the age of 50 could not be taught anything. The purpose of the bill was to require the registration of agencies for the blind, so as to make sure that the public sympathy would not be exploited by unworthy ones. The Lancet states that the Board of Education extends facilities for training blind students, especially to form a link between the schools and the workshops. The bill would give grants to institutions for their training.

Adams writes of the history of the Illinois School for the Blind. The course is explained, the ability of the pupils being tested in the lower grades, so that by the time they reach the upper ones the line of work they should follow is known. There are four classes of students: totally blind, 27 per cent; light perception, 33 per cent; nearly blind, 18 per cent; and useful vision, 20 per cent. Nearly blind are those able to see large objects or count fingers at one foot, but not able to get around easily by the use of sight alone. Certain children cannot see well enough to make use of ordinarily printed books. They should have special, well-lighted rooms, and special methods of teaching. The objects are: (1) the minimizing of eyestrain; (2) the teaching of each child how to conserve his own vision; and (3) the giving of vocational guidance and training. **Comstock** reviews the situation in Ohio, Indiana and Michigan in regard to employment of the adult blind.

Causes and Prevention of Blindness.—A tabulated report on the causes of blindness during the first ten years of life was published by **Darrieux.** The author refers to a former article on this subject by Trouseau and amplifies the literature by recording his observations in 267 cases. Injury was the cause of fourteen, conjunctivitis or kerato-conjunctivitis of eighty-seven, one hundred and fifty-six were due to some disease of the globe, and in ten no history could be obtained and the underlying cause was undetermined. In fifty-seven of the cases hereditary syphilis was the certain cause, and in three the probable cause of blindness. **Howe,** for the Committee on the Prevention of Hereditary Blindness reported progress in collecting data and in sifting out fundamental facts concerning hereditary eye defects. The Committee on Blindness of the Missouri State Medical Association reports that its work has been confined to stamping out trachoma. It believes that wide publicity should be given through the public press and in schools. Education would accomplish more than laws. This movement should be led by the county medical societies. **Dimitry** urges that trachoma is sufficiently frequent in Louisiana to demand investigation.

Economics of Blindness.—The subject of compensation for industrial eye injuries and the closely related subject of estimation of industrial visual deficiency have received much attention during the past year. **Druault** gives tables and graphics for estimating the lowering of visual acuity in both eyes. $V = 1/100$ is considered equivalent to blindness. The functional value of the eyes is proportional, not to the distance at which the type can be read, but to the logarithm of that distance.

Higgins discusses the work of a committee of the Milwaukee Oto-Ophthalmic Society. It adopted a table of visual acuities in which $20/20 = 100$ per cent, and $20/350 = 1$ per cent, or 99 per cent loss. Each increase of 10 in the denominator of the fraction is equivalent to a loss of 3 per cent in vision. Thus, 20/30 = 97 per cent vision and 20/40 = 94 per cent. When vision has been impaired by an accident, but can be brought to normal by a clear lens, the disability amounts to one-half of the difference in vision with and without correction, plus any defect remaining after correcting lenses are given. A permanently dilated pupil equals a 5 per cent disability. When the injury has caused a cataract requiring operation, there is 50 per cent disability, plus the disability from subnormal vision after the best correction. In diplopia, the question of the importance of binocular vision to the individual should be considered, but in general the disability is 10 to 20 per cent.

Gradle, reporting for a committee from the Chicago Ophthalmological Society, gives industrial blindness as equal to 20/200. Between 20/20 and 20/160, visual loss increases at the rate of 5.5 per cent for every increase in 10 in the denominator of the fraction; i. e., 20/160 = 77 per cent; 20/170 = 81.5 per cent; 20/190 = 88 per cent; 20/200 = 90 per cent. An additional 10 per cent is awarded for loss of the eyeball. At least two months should elapse between the disappearance of the last visible trace of inflammation and the test for vision. The best possible vision, with or without correcting lenses, is taken. If there is a difference of more than 4 D. of spherical refraction between the eyes, the best vision of the injured eye without glasses is taken as the basis. **Sharp** suggests a table for computing loss of vision in which each foot lost equals 5 per cent, less 10 per cent; e. g., 20/150 = 65 per cent loss (150 × 5 per cent = 75 per cent; — 10 per cent = 65).

The workmen's compensation, with especial reference to loss of vision, was discussed by **Allport.** The author calls attention to the erroneous impression that jurors have regarding our methods of recording vision, and suggests that the compensation table for visual losses which was adopted by the Chicago Ophthalmological Society be made the standard of estimating the percentage of loss of vision in industrial accidents. **Snell, Bedell** and **Virden** have reported on the computation of ocular disability due to injury.

As a unit for industrial blindness **Whitaker** advocates that of Chapman and Sharp. He thinks that 20/220 should be accepted as industrial blindness and that oculists and compensation boards should agree on some such unit. **Ammann** has written on compensation for loss of one eye; and **Vogel** for loss of an eye previously blind.

The blind are classified by **Drummond** into four groups: I, those with sufficient sight for the ordinary Binet test; II, insufficient vision for this, but sufficient for the Knox cube test; III, blind, or almost totally blind, whose sight was lost after vision had been well established, leaving visual imagery; IV, blind, without visual imagery. He gives an adaptation from the Binet-Simon scale for the ages 3 to 15. Additional tests are given, involving the ability to construct geometric figures with pieces of wood. Several other tests are also given. In another paper he gives a method of estimating the mentality of blind children, which cannot be abstracted, and should be read in its original form.

The reduction in the capacity to work following a traumatic cataract cannot be estimated until after the lens is absorbed or removed by operation. **Rasquin** concludes that the capacity of the eye for work must be estimated on the visual acuity obtained with correction by lenses; and that no fixed percentage of disability can be laid down for this class of cases. **Loehlein** has written on giving up the practice of ophthalmology after blindness.

An interesting article on "What It Is Like to Be Blind" was published by **Burrowes.** The author is a gifted writer, who gives a vivid picture of his personal experience.

Sidler-Huguenin has reviewed 300 cases of compensation for ocular injuries, and is impressed by the fact that the disability caused ultimately proves less than is at first supposed. A farmer, who can only distinguish fingers at 2 meters, manages his farm as well as before. Men who gave up their work on account of injury later re-engaged in the same sort of work; and of those who resumed work with reduced wages over one-half have regained their former wage in a year or two. He finds that one eye, assisted by the sense of touch, ultimately gets what is equivalent to stereoscopic vision. He thinks the physician should inform his patient that impairment which leaves 75 per cent vision for fine work, or 50 per cent for ordinary work does not entitle to compensation. The graver injuries must be left to specialists. **Berry** writes of saving sight in the industries.

Medico-Legal.—A case of conviction for failing to provide spectacles for a child regarded as parental neglect, has occurred in London. For three years inspectors have been engaged in seeing that London school children get the treatment prescribed. Their reports show that most parents make the required provision.

It has been decided in New Mexico that impairment of vision in a medicolegal case calls for expert examination to determine the exact extent of the injury. Without such evidence the jury could in no manner determine this. The Court of Appeals of Georgia has ruled that color blindness was not total and permanent blindness. In the case of Bloom vs. Cawley, Bloom, an optician, was fined for profiteering in spectacles, by the police court of Manchester, England.

Follow-up Work in Ophthalmology.—The importance of follow-up work in the eye hospital is emphasized by **Derby,** who outlined the method followed at the Massachusetts Charitable Eye and Ear Infirmary. Patients with corneal ulcers, iritis and injuries are followed up and urged to return for treatment until the eye is quiet. The home environment is investigated in cases of phlyctenules and tuberculosis of the eye. The social service worker follows up cases of interstitial keratitis and sees that their general treatment is being carried out, and all other cases needing supervision are referred to this department. The work is an educational one and is of great economic value.

Miscellaneous.—A plea for scientific team work in the diagnosis and treatment of diseases of the eye, ear, nose and throat has been made by **Cary.** He raises the question of whether or not it is wise to have hospitals restricted to the treatment of these particular classes of diseases. Or if it would not be a better plan to have no special hospitals, but merely special departments in general hospitals. The latter method is economical and the service rendered reaches the highest efficiency in benefit to those who avail themselves of it. On the other hand, **Allport** has written on better special service in general hospitals.

Oppenheimer has written on group study in the surgery of the head. Hospital standardization is the subject of an editorial by **Swift.**

Cooper has written on the relation of public health work in North Carolina to the business interests of the eye, ear, nose and throat specialists. **Ziegler** describes his method of keeping histories and accounts. The history cards are 6 x 6¾, and contain a skeleton outline for routine items. He has supplementary cards for lengthy histories. Fields of vision, etc., are attached by clips or kept in envelopes. **Maynard** has called attention to the inadequacy of the Calcutta eye hospital.

Education, History, Biography

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This section carries the literature from September, 1919, to October, 1920. For previous references, see A. J. O., December, 1919, p. 323.

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DIGEST OF THE LITERATURE.

Ophthalmic Education and Examinations.—A valuable symposium on the teaching of ophthalmology includes papers by **Verhoeff, Wiener** and **Duane.** As requirements for admission to a graduate school of ophthalmology, Verhoeff proposes a degree from an approved medical school which requires for matriculation at least two years of collegiate work, and in addition such practical clinical experience in general medicine, surgery, dermatology, syphilology, oto-laryngology and neurology as can be obtained in the outpatient clinics of a large general hospital within six months. The course for the degree of doctor of ophthalmology should occupy two years, the first of which should be devoted to clinical and laboratory work, and the second to service as ophthalmic interne or assistant in an approved hospital.

Wiener especially urges more thorough training of the student's power of observation and individual thinking. Duane is impressed with the necessity of thorough drill in the theory of each branch of ophthalmology before taking up its practical application. He presents a carefully worked-out syllabus of ophthalmologic teaching, with a suggested number of hours to be given to each subject. In the issue of the Archives of Ophthalmology publishing this symposium will also be found a valuable report of the discussion which took place upon the three papers. A reviewer in the British Medical Journal, under the heading of the Teaching of Ophthalmology, calls attention to the great difficulty of finding expert ophthalmologists who are prepared to give sufficient time for the elaborate didactic, laboratory and clinical teaching proposed by Verhoeff and Duane.

In his address as chairman of the Section of the A. M. A., **Westcott** called attention to the importance of systematic education in the preparation for ophthalmic practice and the standardization of undergraduate ophthalmic teaching.

The British Journal of Ophthalmology and the Lancet publish an important report by the Council of British Ophthalmologists on the desirability of a special qualification in ophthalmology. The conclusions and recommendations of the council are as follows: (1) It is desirable that the universities and colleges in the United Kingdom should make provision for a special examination in ophthalmology for those who propose to devote themselves to this branch of medicine. (2) It is desirable that ophthalmology should be one of the optional subjects in which a candidate can elect to be examined for the degree of master of surgery of a university or for the diploma of fellow of the Royal College of Surgeons, as is at present the case at the University of London and the Royal College of Surgeons, Edinburgh. (3) Before presenting himself for such an examination the candidate should furnish evidence of at least two years' study of ophthalmology, one of which has been spent in holding recognized ophthalmic appointments. (4) The special examination in ophthalmology should be written, oral and practical, and should comprise the following subjects: anatomy, pathology, optics, systematic and clinical ophthalmology and operative surgery.

Lancaster's account of the research work in ophthalmology conducted at the medical research laboratory of the air service division of the Surgeon General's office draws the moral that physiologic optics and the physiology of vision are not adequately taught in the United States, one of the reasons being that there are no available teachers.

An important practical move to regulate the teaching of ophthalmology has been taken by the University of London, which has sanctioned the granting of the M.S. degree in this specialty. The university's regulations, which provide for the conferring of the degree only on those who have taken the degrees of Bachelor of Medicine and Bachelor of Surgery in the same university, further call for the presentation of certificates of having spent at least two years in the study and practice of ophthalmology at an approved teaching school or schools, and of having held during this time for at least six months an approved appointment in the ophthalmic department of a general hospital recognized by the university or at an ophthalmic hospital recognized by the university.

The examination conducted by the University of London consists of two papers in ophthalmology, one paper in the principles of surgery, a clinical examination; one paper in the anatomy and physiology of the eye and other parts concerned in ophthalmology (including physiologic optics); one paper in the pathology of the eye and other parts concerned in ophthalmology, and an oral examination. It will be noted that the requirements of the University of London makes no specific reference to the practical application of optical principles to refraction.

Story laments the failure of the British General Medical Council to adopt the second of the two reforms urged upon it by the Council of British Ophthalmologists, the two reforms being first to make three months' attendance at an ophthalmic clinic obligatory, and second, to have an examination by ophthalmic surgeons as part of the final examination. The first reform was adopted. Editorial comment in the British Journal of Ophthalmology later expresses regret that the Royal College of Physicians of London and the Royal College of Surgeons of England ranged themselves with the General Medical Council in denying the desirability of instituting a special examination in ophthalmology conducted by ophthalmologists as part of the final medical examination. However, a new diploma in ophthalmic medicine and surgery has been instituted by the London Conjoint Board of the Royal Colleges of Physicians and Surgeons, England. The examination includes in Part I the anatomy and embryology of the visual apparatus, the physiology of vision and elementary optics; and in Part II optical defects of the eye, ophthalmic medicine and surgery and pathology.

In recognition of services rendered by Lieut.-Col. R. H. Elliot to ophthalmology, the Indian government has established in Madras the Elliot Ophthalmic School in connection with the government hospital in the same city. The new school has accommodation for one hundred and twenty students and graduates.

Loeb urges that ophthalmic education would be facilitated if modern text books were arranged in two parts, the first dealing primarily with symptoms as each is related to the various diseases in which it may appear, and the second with the grouping of different symptoms under individual diseases.

Batten believes that, since surgery is only a comparatively small part of the work of an ophthalmologist, there is need for ophthalmic physicians rather than ophthalmic surgeons on the staffs of hospitals. Their rôle would be the study of ophthalmic and related and general conditions. As a result, there would be the tendency to restrict ophthalmic operations to fewer hands, resulting in benefit to the surgeon and to the patient. **Thomson** agrees with this, but the British Journal of Ophthalmology takes exception to Batten's plea for a special course leading to the degree of Ophthalmic Physician, and claims that the latter are not necessary in a well-equipped general hospital. To understand this controversy, American readers should remember that the English practitioner is either a physician or a surgeon; rarely both, whereas a diploma from an American college entitles its holder to practice as either or both.

The British Journal of Ophthalmology believes there is need for reorganizing schools of medicine, and of a dedegree in ophthalmology. The latter would allow confidence in its possessor. Furthermore, there is need of institutional treatment of eye diseases which are not necessarily operative cases. Convalescent homes should be established, to which the patients could be sent when on the road to improvement.

Howe states that the war cut off the opportunities for study formerly furnished by Germany and Austria, leaving no substitute. He suggests that a Department of Public Health be instituted in the United States, with a cabinet officer as its head. This should work in co-operation with the American Medical Association and the various special societies for the solving of research problems. **Bahn** dwells on the advantages of Paris as a teaching center, and names the various eye clinics, their locations and the chiefs of service. Some of the latter give courses in English.

Uribe Troncoso urges upon students and their teachers and also upon the writers of essays on medical subjects that they should inculcate and remember the importance of ascertaining what others have done previously in any given line before attempting to set forth supposedly new ideas, new methods and especially new operations in that field.

The fourth annual report of the American Board for Ophthalmic Examinations gives the total number certificated by the board to date as 128, out of about 200 who had made application. In an editorial in the American Journal of Ophthalmology, which emphasizes the important place given by the American Board for Ophthalmic Examinations to the furnishing of thorough case reports, **Jackson** intimates that the weak points of candidates who have appeared before the board have lain not so much in theoretical training as in practical training for ophthalmic practice, such as ability to take a field of vision by any one standard method, to recognize disease with the ophthalmoscope or to show complete mastery of even a single routine method of testing the ocular movements.

The education of a physician does not cease upon his graduation. His medical life is a continual postgraduate course; and nowhere does he get better training than at the meeting of medical societies. For ophthalmologists, the meeting of the International Congress at Washington is of special interest.

History.—A marked similarity between the different ophthalmologic definitions of medieval writers is explained by **Hirschberg** as due to their having been taken from a common Greek origin, the "Ophthalmology" of Demosthenes, a medical writer of the first century after Christ. Demosthenes did not create but collected the Greek canon of ophthalmology which was drawn upon by all later writers. The Greek text of Demosthenes' work was probably lost in the ninth century, but there was a Latin translation from the second half of the fourth century.

Additional minor contributions of **Hirschberg** to the history of ophthalmology include: (1) A description of the oldest drawing of a shot injury of the eye, on an Attic porcelain dish by Euphronius. The picture represents the fight of Hercules against the three-headed Geryoneus. An arrow has penetrated the right eye. (2) A discussion of the use by Goethe of the German word "Augenwimper," as relating to the eyebrow instead of the eyelashes, together with a commentary on the Latin word "cilium" for an eyelash. (3) A dissertation on the etymological vagaries of the word "orbit," the Latin equivalent of which originally signified a wheel, the track or rut of a wagon, or the pathway of a revolution (of a moving body). (4) A short description of a noteworthy eye operation performed in antiquity, namely, the correction of a secondary pupil, which produced double vision, by covering it with an artificial corneal scar. (6) A gathering together of many historical allusions to the effects of smallpox on the eyes.

Pi gives a brief historical account of ophthalmic practice from 2679 B. C. to 1368 A. D. The writer quotes largely from ancient Chinese books on medicine. After discussing the old theories of the etiology of eye diseases he refers to what the books say on symptoms and the numerous methods of treatment. As an example, a medical treatise written about 620 A. D. during the Tang dynasty, classifies the diseases of the cornea as follows:

1. Jeh Yi, or hot cornea (corneal ulcer or infiltration).
2. Ping Yi, or icy cornea (a nebula).
3. Hsü Yi, or deep cornea (a leucoma).

The cause of these diseases is overwork or small pox.

An historical sketch of the beginning of fundus illustration is given by **Wallace**, a work made difficult by the war conditions. V. Helmholtz's description of the ophthalmoscope in 1851 was followed in 1853 by Van Trigt's essay, De Speculo Oculi, containing the first plates of fundus drawings. Gradually journals and society reports began to print articles containing ophthalmoscopic drawings and the different special works on the subject appeared. Interesting remarks accompany the enumeration of the works of Jaeger, Liebreich, Magnus, Gowers, Loring, Galezowski, Frost, Adams. Concluding, he asks what help photography may afford us in the future, and he hopes yet to see photographs that will surpass the best drawings of today, though fully realizing the difficulties that have to be overcome.

Van Duyse writes concerning the use of artificial eyes in ancient Egypt, as demonstrated in mummy remains. These eyes were in glass or enamel. **Gabrielidés**, basing his argument upon the text of Homer and Euripides, demonstrates that the conjunctivitis from which Ulysses suffered was of diplobacillary origin. **Espino** reviews the ophthalmologic history of Venezuela. **Meyerhof** gives in German a translation from an Arabic description of a case of trachoma in an Egyptian sultan in the year 1513 A. D. **Terson** traces the development of Parisian ophthalmology. **Frank's** paper on the schematic drawing of the eye in its historic development is a review of Sudhoff's investigations into the same subject.

Biography.—Thomas Young, "the father of physiological optics," is eulogized by **Sheard**, who credits him with the first explanation of accommodation, the first recognition of astigmatism, and the first plausible and possibly most commonly accepted theory of color vision. An account of the life of Juan Santos Fernandez is given by **F. M. Fernandez.** The subject of the paper was born in Cuba and educated largely in Spain and Paris, and has practiced ophthalmology in Havana since 1875.

In the British Masters of Ophthalmology series, **Lloyd-Owen** publishes a biographic sketch of Richard Middlemore, 1804–1891, who was for many years the leading ophthalmologist of western-central England. His book on diseases of the eye in two large volumes, was one of the standard text books. His lectures were attended by many students. He early called attention to the needs of the blind. His career was shaped by the ideal which he thus expressed: "A good oculist should be a good physician, a good surgeon, and something more."

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